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FACTORY

MANAGEMENT AND MAINTENANCE

DECEMBER 1947

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POLITICAL ACTION—
Labor's Blind Alley

THE approach of the 1948 elections brings organized labor in America to a fork in the road.

Straight ahead lies the familiar route of free collective bargaining. Except for an occasional side trip, labor has been traveling it for years. On this road the role of government is to act as traffic cop, removing obstructions for all travelers.

The fork is the road of political action—the road to special privilege for labor. On it government is called upon to clear a special right of way for organized labor—to push aside all others.

Which of these two roads will organized labor take?

Most American labor leaders are now urging their followers toward political action. Their first objective is to "get" all members of Congress who voted for the Taft-Hartley Act. AFL plans to raise a $5 million political combat fund through contributions and a per capita tax on its membership. CIO is soliciting $1 donations for political action from its 6,000,000 members.

For their own sake, however, as well as for the welfare of the country as a whole, the rank and file of organized labor will do well to stop, look and listen before they turn their unions into political action squads. If they examine the facts for themselves, they will make two significant discoveries:

I. Political action is a blind alley for labor.
II. The Taft-Hartley Act is an essential bulwark of free collective bargaining.

A brief discussion of these two statements will show what they mean to organized labor.

I

Political action is a blind alley for labor.

If there is any doubt about that statement, a good way to dispel the doubt is to look at European countries where organized labor has been following a political action line.

Britain, where the Labor Party is in power, is such a country. How is labor faring there? Measured by the good things money buys, the average hourly wage in Britain is less than two-thirds of what it is in the United States. Part of the difference may be accounted for by the fact that the British Isles are poorer in natural resources than the United States. Another reason is the war damage to Britain's plants

But there are two otner big reasons why the British wage earner is far behind the American worker in enjoying the good things of life:

1. The *incentive to produce* has been dulled by vote-catching programs which promise economic security and a levelling of incomes. Lulled by promises of cradle-to-the-grave security and discouraged by high taxes, the British have descended to a state neatly described by the London *Economist:*

"Nobody gains anything from activity or suffers anything from inactivity."

2. To run a program like Britain's requires more and more government functionaries. Civilian employees of the British government have increased by 50% since before the war, putting one worker out of ten on the government payroll. More and more people stop producing and spend their time instead cutting up what others produce. The result is smaller production, higher taxes and lower real wages.

The British Labor Party must accept most of the responsibility for this sorry state of affairs. It is due primarily to a program of political action by organized labor which promised the individual worker security and equality of income—*but which can not deliver either because the incentive to work is gone.*

The lesson for American wage earners is clear. Political action by unions to enforce the economic fallacy of more-and-more-for-less-and-less will end by impoverishing the working man—and bringing the nation to ruin.

Unions exist for collective bargaining, not for politicking.

II

The Taft-Hartley Act is an essential bulwark of free collective bargaining.

Bargaining works satisfactorily only when both parties—management and labor—think they are getting a fairly even break.

Management was very sure that the Wagner Act, as administered from 1935 to 1947, was giving employers the short end of the stick. Furthermore, management's feeling of frustration was no whim. It was justified by case after case where rights were granted to organized labor with no counterbalancing recognition of the rights of management, of individual workers or of the public.

The Taft-Hartley Act goes a long way toward establishing equality in employer-union relations. It may fall short of doing a perfect job. *As a subsequent editorial in this series will show, it leaves virtually untouched the public menace of industry-wide bargaining and labor monopoly. And it leaves unprotected what should be the individual's right to hold a job without joining any particular organization.* But it *does* provide some major safeguards for collective bargaining by striking at abuses.

Organized labor, therefore, has no cause to damn the members of Congress who voted for the Taft-Hartley Act. True, the law will check what has been an uninterrupted march of the labor union bosses toward absolute power. It will do so just as laws in the past—The Sherman Anti-Trust Act, for example—have checked management when it was too greedy. And, as the first section of this editorial points out, the time has come to check the march of the big labor bosses.

Fundamentally, the Taft-Hartley Act gives free collective bargaining a new lease on life. The old lease was running out because the Wagner Act stacked the cards against employers, against individual workers, and against the public.

The road to free collective bargaining is now clear of many of the most menacing obstructions. It is the only road for labor to take in its own self interest. Union workers who let their leaders lure them down the blind alley of political action will do so at their own peril—and at the peril of this great industrial nation.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

THIS IS THE 63RD OF A SERIES

FACTORY
MANAGEMENT AND MAINTENANCE
L. C. MORROW, EDITOR

THE AMERICAN WORKER THINKS FOR HIMSELF

THE American wage earner in the manufacturing industries is a pretty sane citizen. When he has the facts he is prone to make up his mind along lines that are to the right rather than the left.

For four years FACTORY has conducted surveys of worker opinion. (Part of one such survey is reported in this issue.) Here are some of the things we have found over these four years:

1. America's factory workers like incentives. Despite all the talk and action against incentives during the past 15 years, half of the factory workers who are not paid on an incentive basis would like to be. Four out of five who get paid on an incentive or bonus basis feel that the system is fair in their plants.

2. America's factory workers believe in limiting union powers and fixing union responsibility.

3. They want to know where their money goes, and believe unions should make public financial reports.

4. They want to vote before striking.

5. They do not approve of the secondary boycott.

6. They do not believe in a "labor party"; don't want to use union funds for political activity.

7. They are opposed to the nationalization of American factories, and do not like price control.

8. They think performance (not seniority) is of first importance when raises and promotions are being considered.

9. They believe their employers have the workers' interests at heart.

When the workers don't have the facts, their conclusions are different. For example, our latest poll shows that one worker in five believes industry is earning more than 25 per cent on its investment. We find, also, that the worker says he wants the Taft-Hartley law repealed, but when he is asked point by point about the provisions of the law, he lines up pretty well with management on what he wants.

There are matters on which the worker and management do not agree. Our polls show that. Some of those matters are important, too. But there would be nothing gained by listing them here. My intent is to point out that management had a wide-open opportunity to influence worker opinion by making available the facts.

For management to do a good public relations job is particularly important at this time because of the current attack against radical leaders of industry's workers. There has been enough smoke in the Congressional investigations to make people believe there must be some fire. Some companies have gone on the firing line, notably International Harvester Company, whose story is told on other pages in this issue.

Management had more freedom of speech under the Wagner law than it used. However, it is easy to understand the fear engendered by administrative rulings. But the Taft-Hartley law expressly permits the freedom of speech about which the Wagner law created serious doubts. That freedom should be exercised — not to bust unions, not to mislead in any way — simply to give the facts. The American worker would like to have the facts. Basically he is a conservative thinker, and can be trusted to make up his own mind in a way that will be good for the American economy.

L. C. Morrow

HARVESTER WORKERS will in the last analysis determine the success or failure of company move to dislodge present radical leadership of FE-CIO. First gun in attack was letter reproduced on pages 68 and 69. To determine their reaction, FACTORY's

International Harvester's Attack on Radical Labor

ONLY time can tell the over-all importance of International Harvester Company's recent challenge to radical union leadership. The challenge is in the form of a letter addressed to members of the union representing the largest single group of its employees. The major significance of this move is that it is a direct frontal attack by management, in an area where pussyfooting has long been the universally accepted rule.

If Harvester's move brings about any worth-while long-term improvement in the company's relationship with this union, other employers who face the same problem are likely to adopt this method as a precedent. But there have been worth-while short-term results which must not be overlooked. What Harvester has done needs to become familiar history to management while it is still fresh.

Two $64 Questions for Management

Ever since Communist infiltration became evident in the upper levels of some of the big industrial unions, production and industrial relations men have been discussing informally the problems that this develop-

editors interviewed typical workers as they left the plants. For a report on these interviews, see pages 70 and 71

Leadership

ment brought. They repeatedly have asked themselves – and have never satisfactorily answered – two $64 questions:

1. If the union representing its employees is saddled with radical leadership, does this fact doom an employer to labor relations that remain hopelessly snarled?

2. Is there any way for the company to maintain, or restore, with such a union, the kind of working peace that would permit its plants to produce with a minimum of interruptions and assure its workers a steady stream of pay envelopes?

Experience has brought increasing pessimism to management as the post-war Communist Party line aimed toward ever more disruption of company-worker relations in American manufacturing. Perhaps this is the most recent reason why so little action of a positive sort has been undertaken until now.

A long-standing reason for management's reluctance to stick out its neck is, of course, that under the Wagner Act the right of an employer to sound off about union topics was none too clear. The employer probably had the same constitutional right of free speech then as now. But if a good lawyer so advised him, the advice was accompanied prudently by a warning that exercising this right would surely bring down upon him from the union a stack of unfair labor practice charges which then would have to be fought through the pre-Taft-Hartley mazes of National Labor Relations Board procedure. If the board found him guilty, he had no certainty that the courts might not sustain its ruling, thereby making his case an expensive milestone in extending the scope of the NLRB.

A Bad Situation for All Concerned

As everyone who closely follows industrial relations now knows, late in October a letter signed by John L. McCaffrey, president of International Harvester Company, went by mail to the home of each Harvester employee represented by the United Farm Equipment & Metal Workers of America-CIO. It opened by stating that its purpose was to discuss the situation in the eleven Harvester plants where FE is the bargaining representative. It asserted:

"That situation is bad. It is bad for the company. It is bad for our customers. It is bad for *you*."

The McCaffrey letter (see next page) summarized the bad strike situation then existing in Harvester plants. It placed upon the 22 FE locals with which the company bargains in 11 plants full blame for 85 per cent of all Harvester work stoppages in 1945-46-47 that occurred in these FE-organized plants, although the company bargains with 173 other CIO, AFL, and unaffiliated locals.

Then the company, over the signature of its president, tore into the union leadership. McCaffrey charged flatly that company difficulties with this union arise "because in dealing with FE we are dealing with an international union many of whose officers are irresponsible radicals, who have no respect for their contracts, and who are more interested in disruption than in labor-management peace."

Closing paragraphs of the letter pointed out that choice of unions and of union officers is solely the province of workers, but also outlined the company's basic interest in having good relations with FE and restoring better conditions in plants where FE is the bargaining representative. The letter continued:

"If either of us is to have conditions like that, you will have to take some action. We make these suggestions to you."

The company-drawn list of what the individual union member should do to assure a union that represents his views and his interests includes several to

TEXT OF INTERNATIONAL HARVESTER LETTER

October 20, 1947

To All Harvester Employes Represented By FE:

The purpose of this letter is to discuss the situation in the eleven Harvester plants where the United Farm Equipment & Metal Workers (CIO) represent employes.

That situation is bad. It is bad for the Company. It is bad for our customers. It is bad for you. Briefly the situation is:

1. FE has had approximately 1,900 people represented by your union on strike at Louisville Works since September 17, doing no work and earning no pay. The wage losses at Louisville are now more than $225,000.

2. FE has had about 500 people represented by your union on strike at Rock Falls Works since September 22, doing no work and losing pay every day.

3. FE has had wildcat strikes in recent days at Canton Works, Farmall Works, East Moline Works, Tractor Works and West Pullman Works. These, according to union leaders, were "unauthorized" strikes. We don't believe that. We doubt if you believe it. One reason we don't believe it is that union handbills in these cases talked about "supporting the Louisville strike."

All those strikes violated FE's contracts with us.

4. At Louisville, Rock Falls, Farmall and East Moline, FE has sponsored mass picketing, a violation of law. Mass picketing is always an attempt to gain results by illegal force.

5. Over the past week-end, the international leaders of FE asked for strike votes at your plants. Our information is that several of the plants voted "no." Our understanding is, too, that at some of the plants where the vote was recorded as "yes," the methods of getting that result were open to question. You would know best about that. Were you at the meeting? Did you vote? Do you know how your vote was counted?

FE has told you some things that are not so. They have failed to tell you other things that are so. Take the Louisville strike as an example.

Did FE tell you that the Company had offered day-work rate increases from 2½ cents to 15½ cents an hour, affecting 791 employes in 64 day-work classifications? Did FE tell you that the Company had offered increases up to 4½ cents to 82 classifications of piece-workers, affecting approximately 1,100 employes?

Did you know, or did FE tell you, that our Louisville proposal would give wage increases to 1,900 employes and actual wage decreases to no one?

Does that sound as if the Company had been unwilling to bargain? Do you think the Louisville strike needs support? Or do you think FE's international leaders should finish negotiations in an orderly way and get their members back to work?

That's the present situation. The Company has been willing to meet and bargain. The Company has made reasonable proposals to FE not only as to Louisville but as to the other ten plants involved in negotiations. There are only two things we have refused to do.

1. We have refused to meet as long as there was illegal mass picketing or violence at any plant.

2. We have refused to meet whenever there was a strike in violation of contract at any location.

We will continue to require that those conditions be met before we do any bargaining with FE. When they are met, we will bargain again.

What causes these difficulties? Is it because the Company is so hard to live with? Is it because we are anti-union? Is it because we are stingy and unwilling to make any concessions? You can give your own answers from the facts you know.

We say it is none of those things. We say it is because in dealing with FE we are dealing with an international union many of whose officers are irresponsible radicals, who have no respect for their contracts, and who are more interested in disruption than in labor-management peace.

Is there any evidence to support our belief? We think so. I want to give you part of that evidence. But first, I want to give you a fact to keep in mind while you read. That fact is: International Harvester now bargains collectively with 23 international unions and three unaffiliated unions. These unions represent a total of 195 locals. They are of all kinds, CIO, AFL and others. With that in mind, consider these facts:

1. In our fiscal year 1945 at all Harvester operations, there were 163 work stoppages. **OF THESE, 129 WERE BY FE LOCALS.**

2. In our fiscal year 1946 at all Harvester operations, there were 127 work stoppages. **OF THESE, 102 WERE BY FE LOCALS.**

3. In 1947 so far there have been 151 work stoppages in all Harvester operations. **OF THESE, 144 HAVE BEEN BY FE LOCALS.**

Now consider this: our policies at all operations are just about the same. We do not favor one union over another in bargaining. Yet the evidence shows that 22 other international unions get along quite well with Harvester. It looks to us as if it is FE—not the Company, not the other 22 international unions—that is out of step.

Not only does FE have more strikes, it also has longer ones and bigger ones. Most of the work stoppages in plants represented by other unions were brief and involved few men and not much wage loss. Now consider this evidence:

which practically all union officials give at least lip service. Two of these are attending and participating in union meetings, and voting on union issues. Points less frequently mentioned in polite labor organization circles: Making sure of an honest count of votes; telling local leaders what the individual member thinks; and getting his views presented to the international.

At the end of the letter came the punch lines:

"If either your local or your national officers are not properly representing you, see that they change their policies — or get yourself some new leaders. The company has no interest in breaking unions. The company

TO FE-CIO MEMBERS

1. In 1946 the FE strikes resulted in a loss of 14,381,000 man-hours. Employes who were represented by FE lost more than $16,500,000 in wages.

2. So far in 1947, the FE strikes have resulted in a loss of 523,000 man-hours. Employes represented by FE have lost more than $780,000 in wages. This figure is still growing and the leaders of FE are doing their best to make more employes lose more money.

Those are some of the facts you ought to know.

We believe the facts raise some questions that only you can settle. Are the leaders of FE representing your ideas in their acts? Would you like to work without interruption and get your pay regularly? Do you want your union to honor its contracts and live up to its word?

These are things for you to decide. The Company cannot decide them for you. Choosing a union is your business and only yours. Choosing union leaders is your business and only yours.

The Company's interest is simply this: we would like to have good relations with the union that represents you. We would like to have those relations be at least as good as we now have with other unions, including other CIO unions. We would like to feel that our production in your plant will go along steadily. We would like to feel when we reach an agreement with your union that it will be kept.

If either of us is to have conditions like that, you will have to take some action. We make these suggestions to you.

1. Attend union meetings, stay until the end, and make your voice heard.

2. Vote on union issues and make sure your vote is counted right.

3. Tell your local leaders what you think of the way things have been going.

4. See to it that your local leaders present your views to the international officers.

5. If either your local or your international officers are not properly representing you, see that they change their policies—or get yourself some new leaders.

The Company has no interest in breaking unions. The Company wants good relations with responsible unions. We believe you too, want good relations between your union and your Company. We think we can have them, if you want them enough to act.

John L. McCaffrey.

wants good relations with responsible unions. We believe you, too, want good relations between your union and your company. We think we can have them, if you want them enough to act."

Harvester's decision to take the offensive against union leaders of leftish inclination was not based upon emotion generated in the heat of the moment. The move was in part strategic, aimed at achieving major results over a long-term campaign. In part it was tactical, designed to bring immediate results of greater urgency but less over-all significance.

The letter itself hints at more letters to come. Company officers make it clear that they have no intention of dropping the subject now that they have hauled it out into plain view of their employees and the public. They say there are lots of things they still need to tell, and in coming months they propose to keep on telling.

As strategy, the McCaffrey letter to FE-organized employees is in harmony with the company's long-standing practice of writing letters to employees when management felt that the full, straight story was not reaching them through union or other channels. But also this is a logical step in a program that has been operating since early in 1946 and gaining momentum ever since. At that time the company set up within its public relations framework an activity called Employee Information Service, which is responsible for keeping employees informed of matters important to them. The chief medium of EIS is letters mailed to employees at their homes.

To measure the effectiveness of this technique, Harvester retained a leading field-survey organization to poll the workers of one of the company's large plants. The workers at this plant happen to be represented not by FE-CIO, but by the No. 2 union in Harvester, The United Auto Workers-CIO.

The investigation covered a letter written to employees by an executive officer of the company. It concerned nothing of such direct interest to the worker as his wages or his union; instead, it explained the relatively abstruse reasons why Harvester was about to reduce prices of some of its products at a time when most firms were raising prices.

Two Out of Three Remembered

Despite this lack of a personal hook, and after the lapse of 10 to 12 weeks between receipt of the letter and the interviewer's visit to the individual, about two out of three employees recalled the content of the letter. Thus they proved not only that they had read it but also that it had made a remarkably lasting impression upon them.

Most EIS letters deal with the affairs of a single plant, are written at the plant in close cooperation with the plant manager, and he signs them. Information letters addressed to all employees, or letters addressed to any group of employees on matters of high company policy, are normally drafted under the eye of an executive officer of the company, who then signs the communication. The letter about FE leadership was obviously of highest policy importance, and consequently called for the attention and signature of the company's chief operating officer.

Harvester executives recognize two major hurdles that stand across the road as obstacles in convincing the rank-and-file union member that the hell-raising type of radical union leadership is bad for his interests. One of these is that under current conditions of full

employment, few strikers remain out of work very long. They fill in with such jobs as taxi-driver, gas-station grease monkey, or city street laborer if they cannot land promptly in other factories at their own specialties. Thus a strike costs the union member relatively little in loss of income, and he is correspondingly uninterested in questioning the motives and judgment of his local officers in stirring up the dispute or taking it up at the behest of the international.

Also, there is in the mind of the industrial worker the unshakable knowledge that "the union" has won for him many a gain in wages, hours, and miscellaneous improvements of working conditions. The typical member is no expert on labor history or philosophy, knows little of political ideologies. He is not equipped to evaluate which of his own particular gains should be credited to the times, to the AFL or CIO, to his international, or to his local. Closest of all to him is his local, and when it claims the credit he is not inclined to dispute it. Why stick his nose into union politics or criticize the political orientation of his union leaders? It's all right with him as long as they get him $1.56 an hour, two weeks' paid vacation, and the chance to lodge a grievance if he feels someone is pulling any unfair deal on him.

In full awareness of these hurdles to be overcome,

TYPICAL HARVESTER WORKERS TELL *FACTORY'S*

MACHINE OPERATOR

Age 43, with 17 years' service

Management and labor should be equalized; I wish they would get together and straighten things out. Management has always been square with me, but we have a bad situation at the plant. Union representatives have threatened me and some of my buddies.

BENCH WORKER

Age 35, with 8 years' service (female)

I hate the CIO. I don't like this union because of its tactics; always trying to tell you what to do. I read the letter in part and found it too dry. I wish the company would continue to present the facts, but in a more interesting way, if possible.

GRINDER OPERATOR

Age 51, with 20 years' service

I am not too interested in union activities. I joined the union because I had to—or else. But I work nights so I am not too bothered by these things. I only wish the company and the union would get together and let us work.

JOB UNKNOWN

Age 25, term of service unknown (female)

The union is all right with me. I didn't even read that letter. No use to read it; the company always tells the other story. The leaders are doing a good job. I don't take too much interest in it, but I guess I'll go along with the union.

PAINTER

Age 42, with 15 years' service

The letter is all wrong; it's a pack of lies. I didn't vote in the union election, but I agree with the vote in favor of striking. We need a wage increase; everybody I talk to agrees. The foremen push you around a lot—like a bunch of cattle. If you don't like it, out you go.

TRUCK DRIVER

Age 55, with 19 years' service

The letter had a few good points in it. I would be on the company's side, but they do nothing for me. I have to belong to the union to get any benefits; too bad the company can't see these things. Honest, I used to feel like it was coming home to come to work here, but no more. The foremen seem to think they are too good for us. They act bossy and are trying to wear the men out.

STOCK HANDLER

Age 34, with 4 years' service

Oh, hell, that letter is a bunch of lies. Anybody that would even read it is nuts. I tore it up. The union is doing all right by me and I'll stick with them. We got kicked all over the lot before we had a union. We need a raise, and by God we are going to get one.

MAINTENANCE WORKER

Age 45, term of service unknown

I like the tone of the letter. There were a lot of things in it I didn't know before. I wish the company would do more to help us directly, instead of forcing the union to do it. I don't want to strike, but you don't have much choice; you get your head bashed in if you try to cross the picket line.

MACHINE OPERATOR

Age 43, with 16 years' service

Yes, I read the letter and agreed with everything he said. I like the American way of life, but we have a tough problem here to solve.

JOB UNKNOWN

Age 50, term of service unknown

I have my own opinions, but I wouldn't want to say anything unless I was right. You better talk to the steward; he can give you the right dope. I like the union and think it has done a lot for me.

the company management for a long while quietly gathered facts which it felt should help convince workers that FE's current policies are harmful to the employees themselves. The upsurge of public sentiment against Communism seemed to make it probable that the public, including Harvester employees, now would be receptive to such information.

Beyond this, the company faced the situation with which its labor relations men had been struggling for weeks. Negotiations with FE's National Harvester Council over correcting wage inequities in 5000 day-worker jobs at the eleven plants represented by FE had been continuing. But negotiations over both this subject and piece rates at the new Louisville plant had failed to prevent a strike of 1900 employees at Louisville, which was more than a month old when the letter was sent. At Rock Falls, Ill., 500 strikers had been out for almost as long.

What Happened in Louisville

The Louisville walkout was beyond all doubt the principal dispute. It was billed by FE as part of CIO's Southern Organizing Drive and centered on elimination of wage differentials that placed Louisville below plants in the Quad Cities – Davenport, East Moline,

EDITORS THEIR REACTIONS TO COMPANY LETTER

TOOLROOM MAN

Age 36, with 18 years' service

It would be fine if the company would only carry out in practice what they say in the letter. All we hear is "union," "union," "union." There is no place for us to get information about the company's side of the picture. The union tells us their side of the story. Why doesn't the company? It would be better if the company would tell the foreman what's going on, so he could tell us.

MACHINE OPERATOR

Age 58, with 24 years' service

I liked the letter. I wish the company and union would get together. They always settle things at the end. Why can't they do it at the beginning? Both sides are trying to show power and play the big shot. They should think of the worker.

CRANE OPERATOR

Age 40, with 2½ years' service

I didn't understand parts of the letter. It should have been written in simpler English. You could tell that one of those "downtown" boys wrote it. I'm all for the union.

CAFETERIA WORKER

Age 33, with 8 years' service (female)

I read every bit of it and was very much interested. No one seems to know that the company has already made wage offers. I was surprised to learn that a lot of the things the men are griping about are not true.

MACHINE OPERATOR

Age 35, term of service unknown

That letter is a bunch of baloney; nobody will fall for that stuff. The company is only interested in making money. They say, "The hell with the workers." Sure, I think the union is doing the right things. They have done a lot for me.

HANDLER

Age 33, with 9 years' service

I'm all for the union. Management always distorts the facts; that's why I just threw the letter away. You better talk to the union leaders. They can give you the straight facts.

MACHINE OPERATOR

Age 51, with 16 years' service

I read the letter, but the company never tells the union side, and the union never tells the company side. It's too bad the company doesn't wise up and work for the employees like the union does.

TOOLROOM MAN

Age 47, with 14 years' service

I wish the company would do more to keep us informed; we get plenty from the union side. Our foreman never tells us anything. In fact, he is kind of bossy and "stuck up." The company doesn't do anything for us unless they have to, and the union is only working for more power. I like the company, but they should be more square with the workers.

MACHINE OPERATOR

Age 40, with 11 years' service

I didn't even bother to read the letter. I don't pay any attention to all this stuff. I just try to mind my own business.

STOCKHAND

Age 34, with 3 years' service

I liked the letter very much. I didn't know before that the company had offered wage increases. I agree with most of it. The union is always bungling; we are being used as tools. Because of all this over 60 per cent of the union membership is now inactive. I don't go to meetings any more. The company could gain a lot if they would only go to bat for us.

Moline, and Rock Island. The Rock Falls strike, though it involved some wages in dispute, seemed primarily motivated as support to the Louisville strike.

But by October 20 the Louisville negotiations had taken on the frustrating characteristics often encountered over the bargaining table when left-wing unions are across the board. Time and again when it seemed that union and company were on the verge of complete agreement, union demands would be hiked or would take a new direction which therefore required starting conversations again from scratch.

Along with these delaying tactics came union moves which the company saw as pressures to make it concede still more at Louisville. Wildcat strikes broke out in five other plants. Union officers branded these unauthorized, but the walkouts seemed for the purpose of supporting Louisville strikers. Mass picketing, with the inevitable violence, flared at four plants.

So the Company Would Not Bargain

The company retaliated by refusing to meet with the union's bargaining group as long as there was mass picketing, violence, or a strike in violation of contract at any of its FE plants—which as of that moment meant strikes anywhere but Louisville and Rock Falls. McCaffrey's letter reiterated this stand and promised to bargain again when these conditions were met.

This clearly pointed to the tactical purpose of going direct to union members over the heads of union officers. Once the rank and file, at Louisville and other FE-organized plants, should comprehend that management offers were already so close to meeting the union's revised demands for the Louisville unit, the heat would be on their leaders to settle the ruckus and get the men back on the job.

Also, rather than face embarrassing questions from the rank and file about wildcat strikes called in other plants to support the Louisville strike (which the company said could not be settled as long as these conditions should persist), local union officers might be less inclined to sanction work stoppages and violence as pressure measures.

Whether or not the letter was responsible for what occurred thereafter, the tactical developments worked out exactly as management hoped. The letter was mailed on Monday and reached most union members on Tuesday or Wednesday. The Louisville officers called a meeting for the following Sunday to vote on settling or staying out; their constituents voted to accept the company's offer and return to work. That ended the Louisville strike.

Rock Falls remained on strike. But as this article is written, two weeks after McCaffrey's letter went to the employees, no wildcats or other disturbances had marred Harvester's record of peaceful production. This drastic change for the better is hard to account for except as an indication that the letter achieved its short-term objective.

Within the first week after the October 20 letter reached the addressees, FACTORY editors rang doorbells at random in plant neighborhoods and buttonholed workers coming off shift to get interviews with Harvester rank-and-filers in their homes and on the street. Purpose was to learn how the company's move against the union leadership affected worker outlook.

Thirty-three interviews were held. Of the workers talked with, analysis shows that 53 per cent liked the letter and favored the company's contentions; 32 per cent disliked the letter and took up cudgels for the union; 15 per cent had not read the letter or were undecided. This sampling was not large enough to justify general conclusions regarding the attitude of Harvester workers as a whole. However, it does indicate that, despite assertions of stewards and local officers, the company's headlong charge into the union's internal affairs aroused no outraged screams from employees who were not already screaming, and that it brought about no reaction against "company interference."

Startlingly Similar Statements

Six officers and union stewards of locals at two Chicago plants when interviewed voiced oral statements about the McCaffrey letter and union-company relations so startlingly similar in details that it seemed certain they had been coached.

All six asserted that the letter had helped solidarity by arousing resentment; that all votes are always honestly counted; that the company will not bargain honestly but is out to break the union by taking to arbitration more cases than the union treasury can afford. All of them endorsed their leaders 100 per cent, denied any Communism among officers, and declared that the McCaffrey letter was written not by McCaffrey but "by someone downtown who doesn't know what he is talking about."

UNION SLOW TO REPLY, CHARGES FASCISM

CIO internationals are noted for quick-trigger publicizing of their views when their activities and policies are criticized. Veteran observers of the labor scene therefore shared company amazement at FE's failure to hurl back a retort by return mail.

Actually it was more than two weeks after McCaffrey's letter that a 3300-word letter from the union's two top officers was released. This letter, signed jointly by Grant W. Oakes, International President, and Gerald Fielde, International Secretary-Treasurer and Chairman of the National Harvester Council, was addressed to McCaffrey. But it obviously was written to convince union members and all other readers that Harvester's hands are so unclean that nothing emanating from such a source can be believed or trusted. The letter takes roundhouse swings at the company's posi-

tions on labor, prices, profits, and competition. It starts its indictments with the Chicago Haymarket riot of 1886 and particularizes intervening events all the way down to the October, 1947, boost in the common stock dividend rate.

The letter also carries footprints that are familiar to readers of *The Daily Worker*. It mentions Harvester along with half a dozen other big U. S. corporations as having enjoyed close working agreements with the Nazi government. It warns that the union is "fighting fascism in the offing," and refers to "a headlined witch hunt in Washington." Also it aims assorted mud pies at the National Association of Manufacturers, always a favorite target for the radical press.

Another keynote of the letter is the assertion that McCaffrey's letter to employees "could only have been written under the anti-union Taft-Hartley law." The T-H Act is repeatedly mentioned, with all the changes rung upon all the denunciations that have become standard and accepted in union and radical circles since the original bills were introduced to Congress.

Few of Harvester's charges against the union are squarely met in the Oakes-Fielde letter. Most direct rebuttal, and most effective, is that directed against the strike statistics in the company's letter. FE-CIO asks whether, instead of bargaining with 26 unions as the company claims:

"Would it not be more correct to state that Harvester *treats* with 25 unions and *bargains* with FE-CIO? It is clearly and undeniably your company's policy to first oblige our union to establish gains, and then pass them on to other organizations. Your company negotiators have in the past informed AFL, independent, and other CIO committees that what they secured in Harvester contracts depended upon negotiations with FE-CIO. Consequently, it is FE, by far the largest Harvester union, whose members necessarily engage in more union activities of all description, including from time to time and in the course of events so-called work stoppages. But what does the record show in this connection?

"It shows that the great majority of all stoppages occur in two plants of the chain. And in these plants the old tradition of trying to break the union still prevails, despite public statements to the contrary. Every stoppage has been provoked by some untoward or unnecessary act by lower management echelons. Let there be no confusion between cause and effect."

Harvester Blames Union President

The company's informal answers to these points are:

Harvester's union contract expiration dates are scattered through the year, hence it is necessarily among the first big employers to face any new wrinkle in union demands. Since FE has more contracts in Harvester and represents more people than any other union, there unquestionably are more new points battled out with FE negotiators. However, UAW-CIO, representing about five employees for each eight covered by FE contracts, gains new ground for its members in about this same proportion. And UAW-organized plants kick up very few work stoppages. As a practical matter, it would be very difficult to keep any concessions made to any union out of the other 25 contracts.

As for the large number of work stoppages in two plants, the company agrees that in most years these plants account for a majority of all stoppages. However, it attributes these conditions not to any difference in management attitude toward unions in these plants. Rather, Harvester industrial relations men wave a hand toward John T. Watkins, truculent district president of the union in the Quad Cities, where the two most turbulent Harvester locals hang up their work-stoppage records year by year.

Is Their Act Unrehearsed?

Watkins and Fielde are generally considered to carry the highest voltages of FE's upper-level leaders. They are the yes-or-no men in the Harvester contract negotiations. Both came out of the Harvester ranks.

Fielde, 36, is a skillful negotiator who is willing and able to devise or accept a face-saving compromise when the horse-trading becomes tense. Quick of mind and ready of tongue, he is a dangerous opponent in a bargaining session because he is rarely caught off balance. He was a general mechanic at the McCormick Works, Chicago, for nine years. In 1936 he led in organizing the FE local there.

Watkins, 38, was a machine operator at the East Moline, Ill., works for twelve years and has been district president for eight years. Short, chunky, shrewd, and stubborn, he is adept at kicking over applecarts. A familiar sight near the close of Harvester bargaining sessions is Watkins plunging into the smoky room straight from the Rock Island train. He listens to an explanation of a settlement that Fielde has convinced company negotiators they should take. Watkins knocks this down, labels it completely unacceptable to his constituents. Then he leans back with an air of daring the others to please him. It is a tough assignment to try to figure out something by which he will not be angered.

A favorite out-of-hours argument among Harvester's labor relations staff is whether the Watkins-Fielde act is spontaneous or pre-arranged. It never seems to generate any sparks between the two livest wires in FE-CIO.

* * *

Of this recent direct-to-employees action of International Harvester Company, it seems to be a fair summary so far to say:

It had its effect in bringing about the conclusion of the Louisville strike.

It probably dampened enthusiasm for wildcat strikes among FE members.

It let those employees who do not like radical leadership know that the Company will try to do something about it.

It put the FE union leaders on the defensive.

It has begun a trial procedure looking toward positive action by management to combat radical leadership in unions.

DODGE TRUCK PLANT IN MINIATURE. IT HELPED DODGE ENGINEERS MAKE A COMPLETE MODEL CHANGE WITHOUT THE USUAL SHUTDOWN

SCALE MODELS HELP VISUALIZE THE

WILLIAM S. WHEELER • FIELD EDITOR, *FACTORY*, CHICAGO

GONE are the days when a model change meant that an automotive plant had to be shut down.

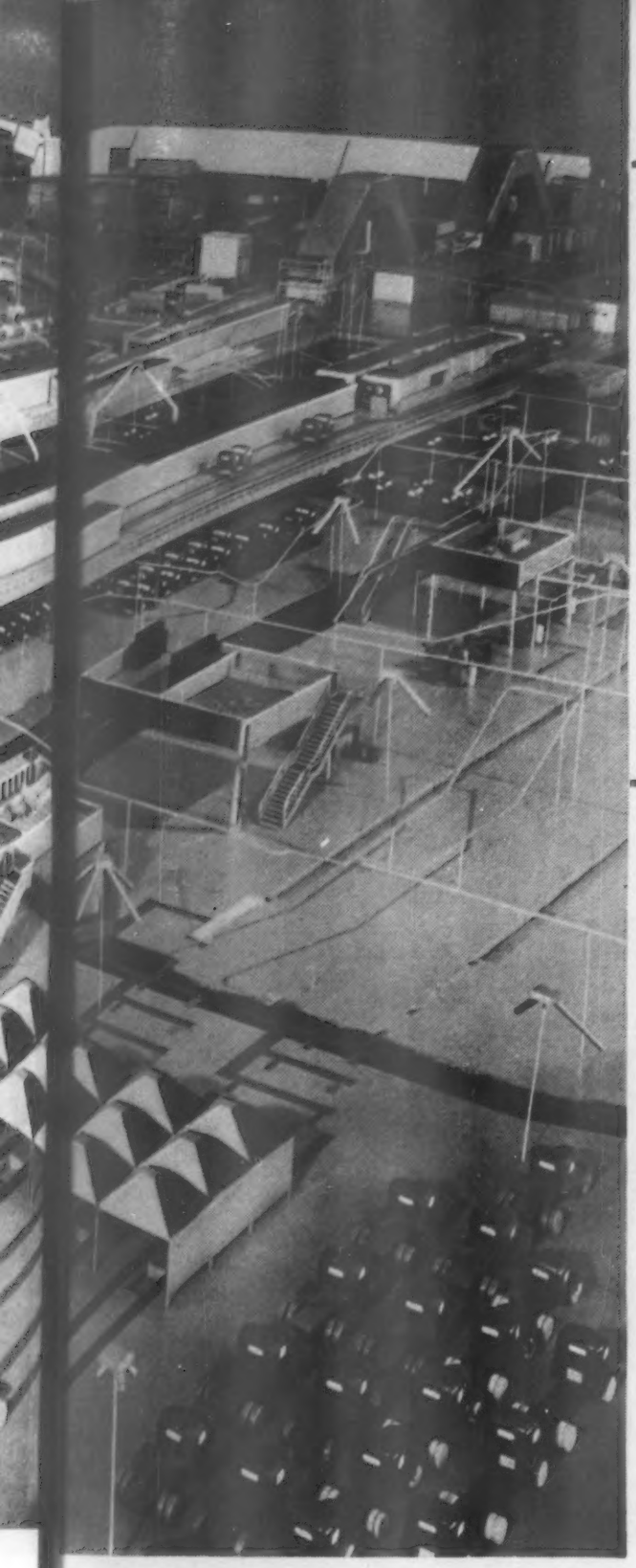
At least those days are gone forever so far as the Dodge Truck Plant in Detroit is concerned. Recently the Dodge Division of Chrysler Corporation was able to make a complete model change in this plant without losing a single minute of assembly time.

Production executives at this plant give credit for this outstanding achievement to use of a three-dimensional layout. They say the men who do the planning can now visualize the entire production operation and find quick answers to the problems that inevitably arise when major plant changes have to be made.

That explains why the company went to the trouble of reproducing the entire plant to scale. That is why it went to the expense of making scale models of every item of equipment.

It's a big plant—1260 feet long by 780 feet wide, with 1,273,000 square feet of floor space. Which meant a big model—22 by 28 feet—with hundreds and hundreds of replicas of machines and equipment.

Shown above is a small portion of the layout model with one of the body assembly lines in the



LEGEND

BLACK	AISLEWAYS	OLIVE GREEN	PARTITIONS, FACTORY
GRAY	FLOORS	BROWN	OFFICE EQUIPMENT
LIGHT GRAY	MACHINERY	ORANGE	HANDLING EQUIPMENT
RED	SLAT CONVEYORS	SILVER	OVERHEAD CONVEYORS

BLUE ..... EXHAUST SYSTEM FOR CARBON DIOXIDE FUMES
YELLOW ..... MATERIALS IN STORAGE OR TRANSIT
CREAM ..... WALLS AND PARTITIONS, OFFICE
WHITE ..... FIRST AID EQUIPMENT, GLASS AREAS

YELLOW STRING TIED ON MACHINES ..... RE-LOCATION
RED STRING TIED ON MACHINES ..... NEW EQUIPMENT
RED PAPER TACKED TO MODEL BASE ..... MODEL NOT MADE

AT RIGHT, DODGE TRUCK PLANT IN ACTUALITY. SHOWN IS THE BODY LINE SEEN IN BACKGROUND OF PHOTOGRAPH ON FACING PAGE

PRODUCTION JOB

background. The illustration to the right is a view of the actual line in the Dodge plant. On the next page is an enlarged view of the area shown in the foreground of the model above.

Everything is there—from office furniture and first aid rooms to unit heaters and monorail systems. Every machine that is used or will be used, every conveyor line, every power truck, every major assembly, is reproduced in exact scale. With the model, a complete review can be made of the plant in minutes. To do it on foot out in the plant would require hours.

It was no idle whim, therefore, that led Dodge management into this venture. Five mighty good reasons prompted it. Company methods men figured:

1. A better all-around planning job could be done.

2. Production down-time at model-change time could be minimized, possibly eliminated.

3. Floor space could be utilized to the last square foot.

4. Flow of materials could be regulated with no backtracking.

5. Working conditions could be improved.

Those five assumptions proved to be correct in every detail. And of course they add up to greater output at lower cost.

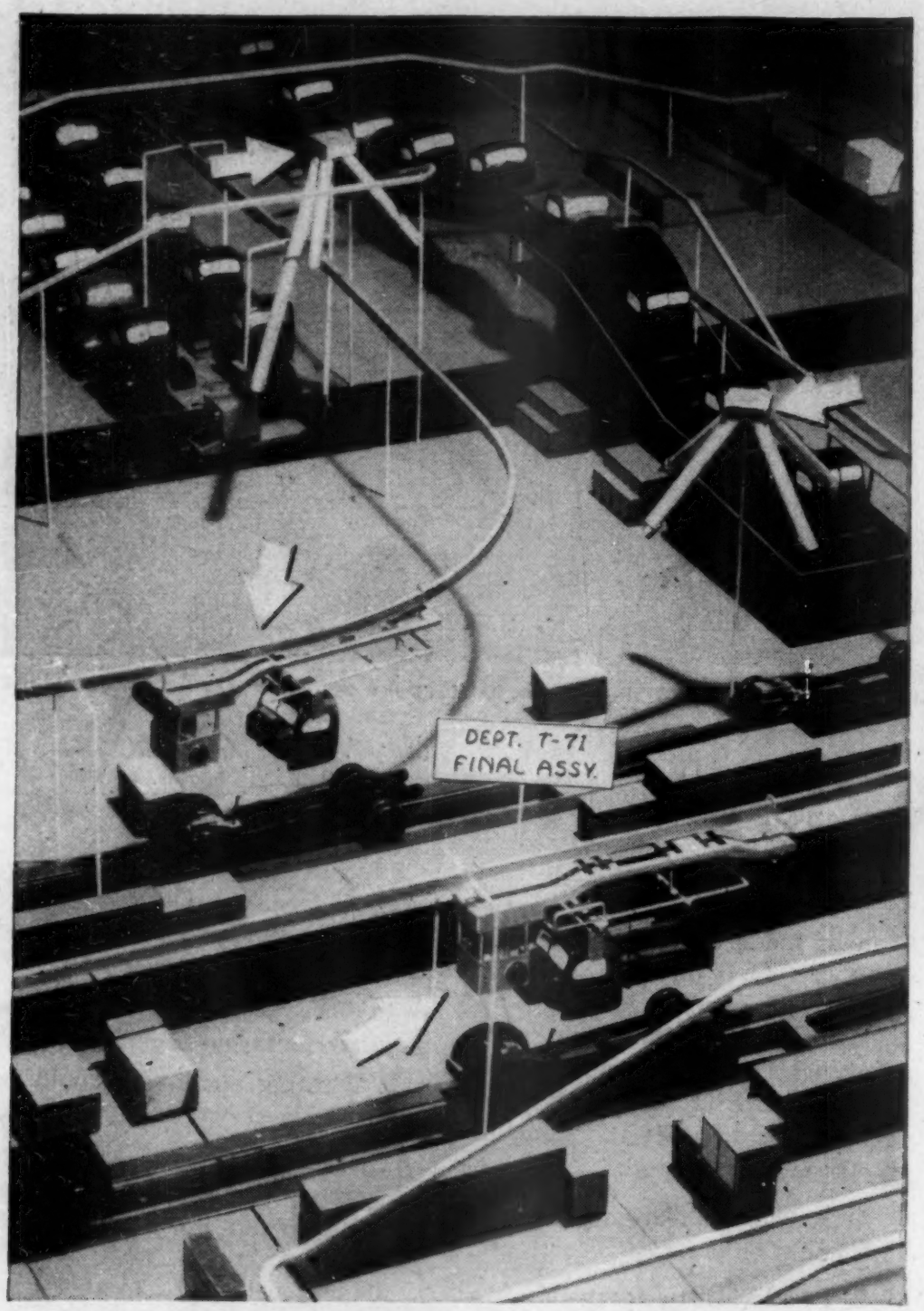
Model boards are located in a special room close to production areas, so the layout is accessible

to executives and supervisors alike. Production and maintenance men can reach the room in a matter of minutes to discuss problems difficult to handle out in the plant. Meetings are constantly held to determine the best methods to follow in making changes in existing layouts or devising new production lines.

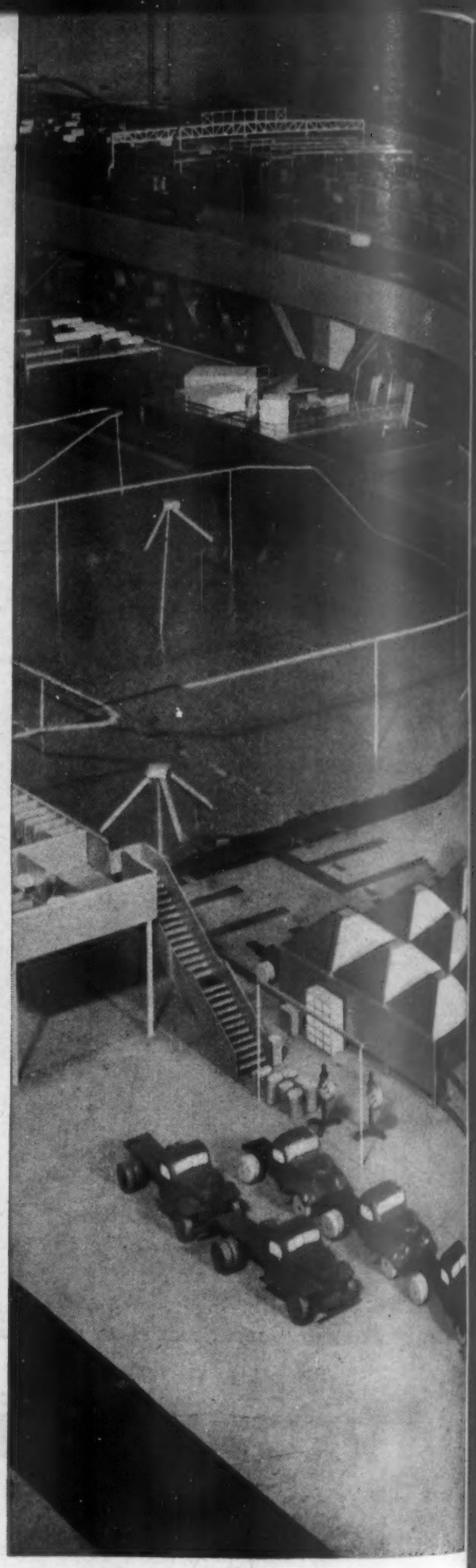
Every change in an old layout or design of a new production system must be approved by all members of the management group. Every assistant foreman, the departmental foreman, the general foreman, and the plant superintendent must sign his name in approving the final layout plan. Likewise, the key personnel in the materials and maintenance divisions must approve in writing.

This practice eliminates arguments after installation. No one can say, "I didn't see that," or "I could have told you it wouldn't work." All concerned use the model with great care and interest. They know their names are on the dotted line when a layout or change is finally approved. The model has taken the place of reams of blueprints. Even more important is the fact that with this three-dimensional layout, everyone sees just what change is contemplated before it is actually made.

The model was built on 616 square feet of composition board on a scale of ¼ inch to the foot. The layout is so exact in detail that 31 separate styles of model truck frames are available to correspond with trucks in actual production. Overhead conveyor systems are shaped of metal and follow the same routes followed by real conveyors in the plant. Indi-



CLOSE-UP OF FINAL ASSEMBLY LINE. Arrows point to unit heater and to cabs (on monorail) ready to be dropped on truck chassis



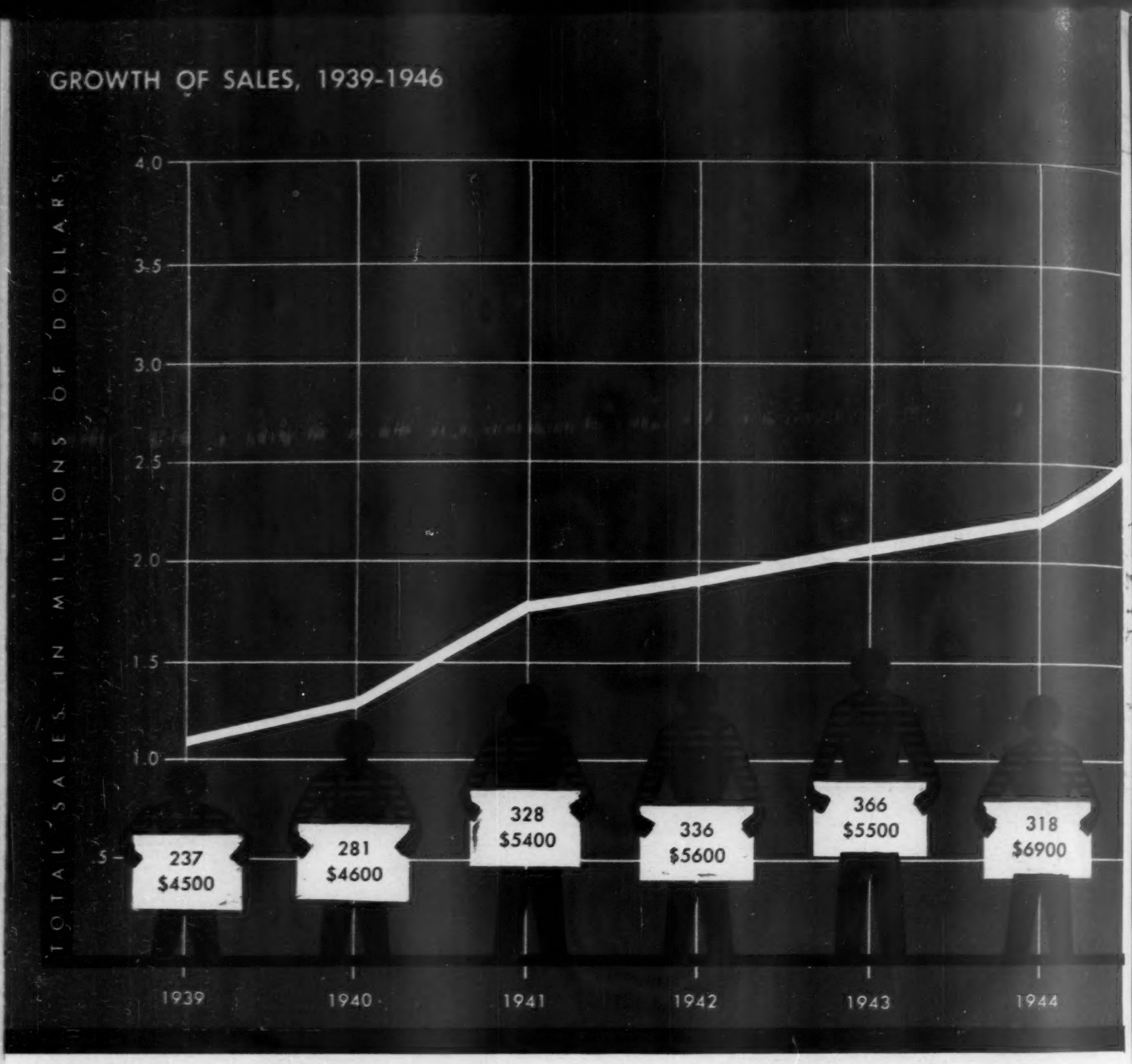
PLANT MANAGER E. J. McPHEE AND HIS ASSISTANT, W. G. FINZEL, DISCUSS AN OPERATION NEAR END OF TRUCK ASSEMBLY LINES

vidual models are made either from soft pine or metal and painted. Small nails attached to the bottom of each hold it in place.

The color scheme on the model is purely functional. Where possible, colors correspond to actual painting in the plant. For instance, floors are gray, furniture is brown, machinery is light gray, first aid equipment white, and office partitions are cream. Users of the model soon learn its color code.

Second-story sections of this model are raised and lowered by hand cranks. People working at the board can view the lower floor easily with the upper floor raised. The trial-and-error period is completed in the layout room before the production budget is dented by a major expenditure. Each move is plotted in detail so that all departments involved know just what is expected of them.

Four men work full-time to keep the model up to date. The layout will never reach a point of completion; technological advances require continuous changes.



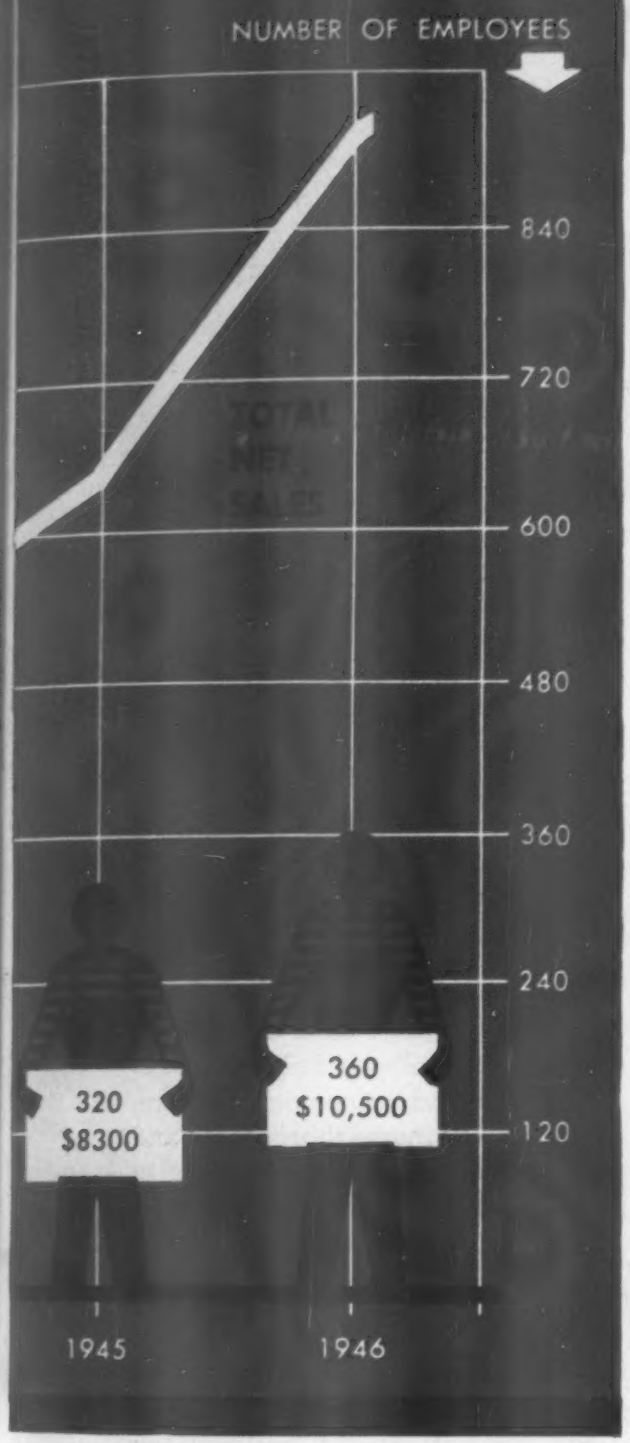
PRODUCTIVITY at Porter-Cable rose from $4500 per man in 1939 (237 employees) to $10,500 per man in 1946 (360 employees). The company gives much of the credit for this achievement to its well-organized employee relations program. Special emphasis in the program is given to presentation of economic facts. Charts herewith are samples of "how it's done"

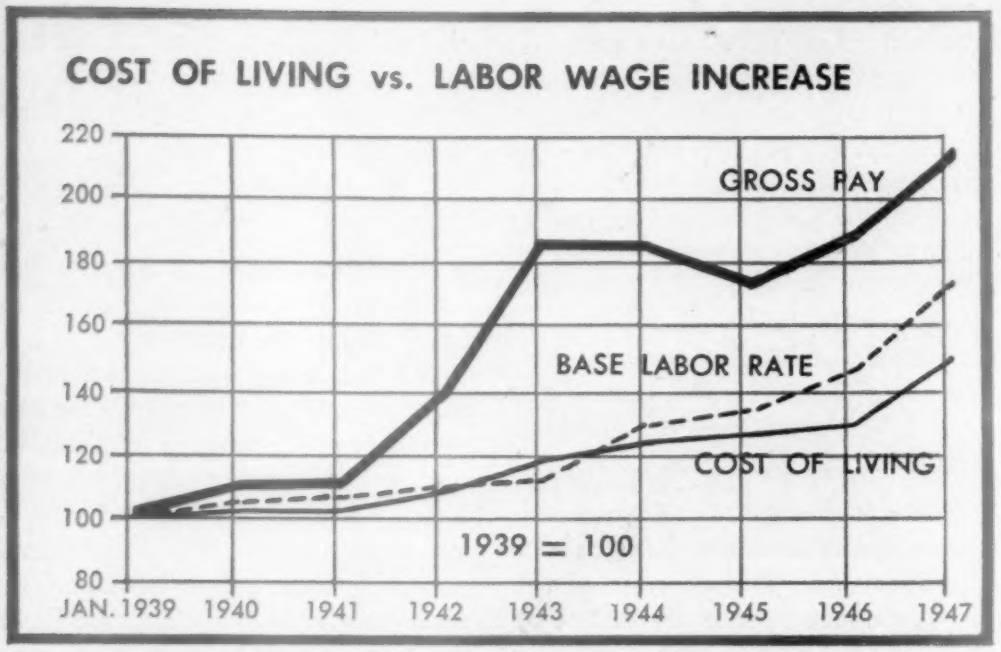
EMPLOYEE RELATIONS PLAN HELPS DOUBLE SMALL-PLANT PRODUCTIVITY

R. C. TYO • COMPTROLLER AND SECRETARY, PORTER-CABLE MACHINE COMPANY
SYRACUSE, N. Y.

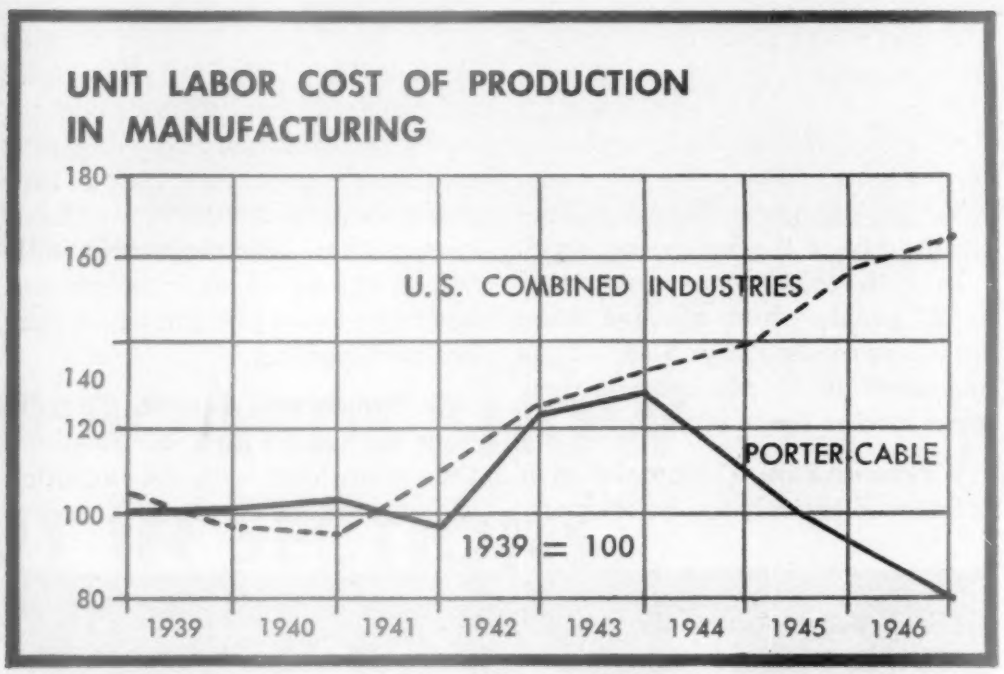
PRODUCTIVITY per man at the Porter-Cable Machine Company rose from $4500 in 1939 to $10,500 in 1946. An employee relations plan is primarily responsible. There are nine major points in the plan, and I shall describe them, but first let me draw a brief picture of our company and state our economic philosophy.

Porter-Cable manufactures portable electric saws and sanders, belt grinders, floor sanders and edgers. It is a small corporation employing some 375 people. It is our philosophy that our profit should be distributed through the following channels:





TAKE-HOME PAY at Porter-Cable has far outstripped the rise in cost of living since 1939. Facts like these are published regularly in the employee paper. By keeping employees informed, the company believes it gains their cooperation



PAY-OFF on industrial relations program is in lower unit labor costs, which are compared here with industry average. This is another of the simple but effective charts used by management in this small plant to pass on company facts

*1. **Stockholders,*** by means of dividends, as a return for the risk of investing their money.

*2. **Employees*** (associates) of the company, by means of profit sharing, because it is through their ingenuity, cooperation, and teamwork that profits can be increased over a normal level.

*3. **Customers,*** by means of reduced selling prices, as a reward for investing money and confidence in our products.

*4. **Working Capital*** — Profit retained in the business to handle increased volume, increased inventories, and increase in machinery and equipment.

Now consider the nine major points of the plan:

*1. **Multiple Management.*** Executives, supervisors, foremen, group leaders, and other associates (employees) assume full responsibility for their jobs, and contribute valuable ideas to improve them. Management is effectively decentralized.

*2. **Labor - Management Committee.*** Seven labor and three management representatives meet semimonthly. They discuss common problems and work toward solutions. Company policies are brought up for possible improvement. New representatives of labor are elected semiannually by the office and factory workers.

*3. **Employees' Association.*** Club rooms for the employees' association were financed by the company in 1941. They include bowling alleys, pool tables, ping pong tables, shuffleboard, two bars, cafeteria, and a dance floor. The association was in-

corporated under its own name. It has by-laws, its own set of books, and operates without interference from the company. Officers and trustees are elected yearly. The company is paid rent for the building and receives a monthly payment on the loan. Fees from bowling, the bars, parties, and dances pay club expenses. In 1946, the association had a net profit of $5000. Executives and labor alike are on common ground in the clubrooms.

4. Profit Sharing. Employees with the company a year or longer share in the profits. The amount of the profit sharing fund is arrived at by means of a formula based upon net sales. When this fund has been determined, it is turned over to a trust. The amount to be received by each individual is based upon his income for the period from October 1 to September 30.

Our plan is not a substitute for high wages. We agree to pay at least the average labor rate in the area, with the promise that we will attempt to be in the higher pay level.

In 1946, $85,000 was distributed to 287 people whose average share was approximately $300. This amounted to 10 per cent of their gross income for the fiscal year.

5. Pension Plan. The pension plan is financed entirely by the company and calls for retirement at the age of 65 or upon disability or illness which prevents the employee from doing any further work.

6. Individual Incentive. In addition to the profit sharing plan as described in Section 4, an individual incentive or piecework plan is in operation in the company.

We do not feel that profit sharing alone is sufficient incentive for our people to produce more. We believe that profit sharing does produce teamwork, cooperation, and a feeling of confidence in the company.

But *individual incentives or piece-work plans* such as we have produce greater output. This is because it is up to the individual to increase his earnings through individual effort without depending upon anyone else.

It is less difficult, because of profit sharing, for us to sell our associates on changing incentive rates because of method changes, re-tooling, new machines, suggestions, etc., as they know they will result in lower labor cost, without affecting their individual income, which in the end will add more to the profit in which they are participating.

7. Suggestion System. Suggestions are turned in by all people in the organization with the exception of supervisors. A committee reviews all suggestions. The cost department analyzes each to determine the savings involved. One-half of all savings resulting from a suggestion on one year's production is given to the employee. An initial payment may be made first until this amount has been determined.

8. Presentation of Economic Facts. To gain the cooperation of all workers, the company felt they should be informed about policy, financial conditions, sales practices, production schedules, and forecasts. Employees eagerly await this information in each issue of "Cablet," the company paper.

Each year when the profit sharing fund is distributed to employees, financial facts and figures are prepared to show them what has happened in the past year, and what is forecast for the coming year. Simple bar and graph charts illustrate this information. All employees are given opportunity to ask questions.

Attendance at evening classes is encouraged with financial assistance by the company. Courses at local schools and colleges help individuals understand the company's financial set-up more thoroughly and give them constructive ideas as to how they can do their jobs better.

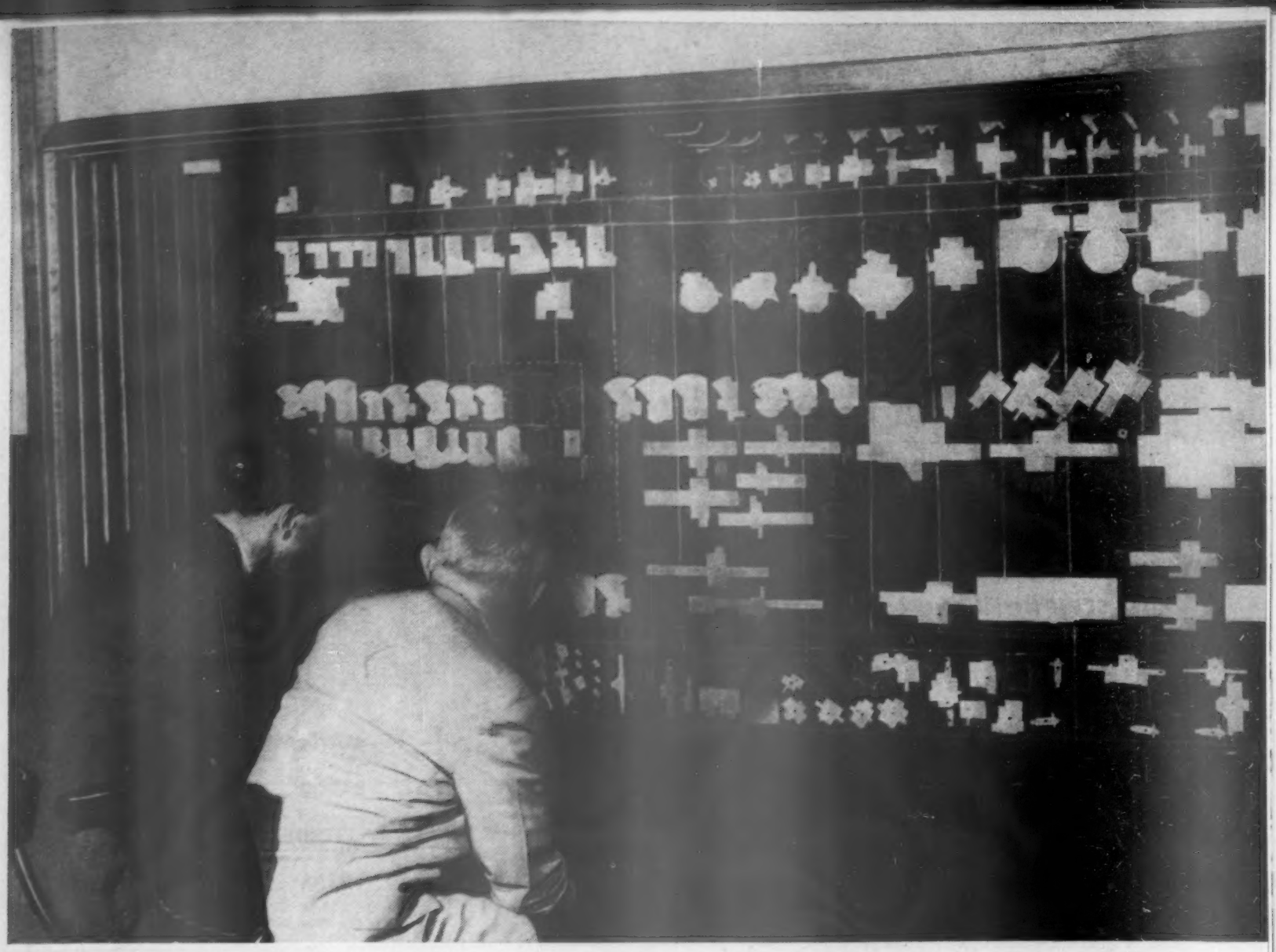
9. Music in the Factory. A balanced program of records is piped into the factory 15 minutes in the morning and 15 minutes in the afternoon. This form of relaxation helps ward off fatigue. Although results of this program are difficult to determine, the practice has met with a great deal of enthusiasm.

PROFIT SHARING is one of the techniques used at Porter-Cable. No substitute for high wages, it has done much to boost productivity per man. Here president of company's independent union gets profit-sharing check from foreman

A very vital part of this employee relations plan rests in the responsibility of executives, supervisors, foremen, and group leaders to weed out of the organization those people who fail to pull their share of work.

The company believes that the plan can achieve the desired results, which are to:

1. Combat high costs, low productivity. 2. Foster job enthusiasm, increase output per man, strengthen employee morale. 3. Unqualifiedly prove that greater benefits to all will result from unity of purpose and teamwork.



SIX LAYOUT BOARDS ARE SUSPENDED IN A FRAME, CAN BE PULLED DOWN MUCH LIKE WINDOWS—AND PUSHED UP AGAIN AFTER USE

DISAPPEARING BOARDS SHOW PLANT LAYOUT IN SECTIONS

CHARLES H. PARKS • ASSISTANT WORKS MANAGER, THE BULLARD COMPANY, BRIDGEPORT, CONN.

Two men can sit in the works manager's office at Bullard and take a look at the entire plant without stirring from their chairs. Or a fairly large group can get together for discussion of a plant move. This is made possible by a series of layout boards suspended in a frame in much the same way that an ordinary window is suspended in a spring sash.

The frame contains six standard 4x8-ft. wallboards, soft enough to take tacks and staples. The back board is fixed in the *down* position. The front board is fixed in the *up* position, and contains a small diagram of the entire plant. Thus there are, in effect, eight 4x8-ft. boards. The scale used for the detailed layouts is ¼ inch = 1 foot. The whole frame occupies a floor space of only 2x8 feet.

Drawings or blueprints show the outlines and principal features of the buildings. Cardboard templets have been made up for all productive machines. Special precautions are noted on the templets, such as the necessity for pits in the floor, unusually high ceilings, or special current characteristics which require attention.

When the layout of a department has to be changed, a pencil or white crayon line is drawn around each machine, and marked with the machine number. Templets are then moved around until the best possible layout is found. In this way both the old and the new locations of the machines are plain to see.

After a new layout has been decided upon—always with the help of the foreman in charge of the department—millwrights, riggers, and electricians are called in, and arrangements are made to have all the necessary utilities available. In this way everyone has a chance to be in on the move before it is made. Then work orders are issued to the millwright department for the disconnecting, removal, and reconnecting of the machines. By referring to the outlines of the machines in their original positions, it is much easier to plan the move in the way that will cause the least interruption to production.

1

REQUEST FOR WORK ORDER

NO. 21653

WORK TO BE DONE FOR River Road Plant
WORK TO BE DONE BY Carpenters
" " " " " Pipefitters
" " " " " Electricians
" " " " "

DATE ISSUED April 5, 1947
CHARGE TO Dept. 55
REQUESTED BY V. Gilberti
OFFICIAL APPROVAL O. J. Blank
DATE REQUIRED at once

DESCRIPTION AND LOCATION OF WORK TO BE DONE

Put in a new wash room on second floor of River Road Plant with all equipment

ESTIMATE OF COST

MATERIAL $242.00
LABOR 200.00
OVERHEAD 150.00
TOTAL $592.00

1. REQUEST FOR WORK ORDER is executed by a department head who wants work done by maintenance department. He fills in entire form except cost estimate and serial number. These are added after request reaches plant engineer's office

2. WORK ORDER FORM (five copies, see top part of illustration on facing page) goes to craft divisions doing the work, plant engineer, and requestor. Copy for cost department includes lower part, as illustrated, used to accumulate costs

CLOSE CONTROL OF MAINTENANCE

3

WORK ORDER REGISTER

NUMBER	DATE Mo.	Da.	Yr.	WORK TO BE DONE BY	WORK TO BE DONE FOR	DESCRIPTION OF WORK
21653	4	7	47	Carpenter Shop	River Road	Construct wash room 2nd floor
				Pipe Shop		
				Electrical Shop		
21654	4	7	47	Tin Shop	Dept. 68	Make trough for pouring paste
21655	4	8	47	Machine Shop	W. Schaefer	Make 12 ratchets for BM magazin
21656	4	9	47	Maintenance	Laboratory	Replace broken paddles in exper

3. WORK ORDER REGISTER IS A SUMMARY RECORD WHICH QUICKLY SHOWS THE PLANT ENGINEER THE WORK LOAD, STATUS

2

WORK ORDER No. 21654

WORK TO BE DONE FOR River Road Plant — CHARGE TO Dept. #55 — DATE ISSUED 4/7/47

WORK TO BE DONE BY Carpenter Shop — REQUESTED BY V. Gilberti

" " " " " Pipe Shop — OFFICIAL APPROVAL O. J. Blank

" " " " " Electrical Shop — COMPLETED WORK APPROVED BY

" " " " " — DATE REQUIRED at once — DATE COMPLETED 6/10

DESCRIPTION AND LOCATION OF WORK TO BE DONE

Construct new wash room on second floor and furnish complete --
River Road Plant

ESTIMATE OF COST: MATERIAL 242.00 LABOR 200.00 OVERHEAD 150.00 TOTAL 592.00

COST DEPARTMENT POSTINGS

DATE		DEPT. 14			DEPT. 32			DEPT. 51			MATERIAL		TOTAL	
Mo.	Day	Hours	Direct Labor	Over-head	Hours	Direct Labor	Over-head	Hours	Direct Labor	Over-head	Reference	Amount	This Month	To Date
4	30	31 0	38 75	29 06	26 0	32 50	24 38	18 5	23 13	17 35	Reg.	69 70	234 87	
5	31	42 0	53 50	39 38	8 5	10 63	7 97	24 0	30 00	22 50	Inv.	161 00	323 98	558 85
6	30	11 0	13 75	10 31							Inv.	7 40	31 46	590 31
			105 00	78 75		43 13	32 35		53 13	39 35		238 10	590 31	

WITH THREE-FORM SYSTEM

DONE	DATE CLOSED		
rnish complete	5	15	47
	6	10	47
	5	16	47
	4	16	47
al tank	4	11	47

OF ANY ORDER, AND LAGGING ORDERS

J. RUSSELL TAYLOR • PLANT ENGINEER, R. M. HOLLINGSHEAD CORPORATION
CAMDEN, N. J.

THREE easy-to-understand forms provide efficient control of all repair work and new construction in the four Camden, N. J., plants of this company. These forms cover both the small distracting maintenance chores and the big important jobs equally well. Administrative features of their application are simple, and clerical effort is not burdensome. In the final count, the desired work gets done at the right time, and for the right cost. If not, the record quickly shows the reason why.

Basically, the work order system in this group of plants, which devotes about 13 acres of floor area to the manufacture of automotive chemicals, is designed to handle engineering service work of any nature, as required by all production departments. Its scope is not limited to the maintenance and repair of plant buildings, machinery, and equipment, customarily handled by a staff of 75 maintenance men. It also controls the provision of new equipment for production processes as fabricated by other service departments.

It is used, for instance, to order

new patterns, tools, or dies. Or if a gang of laborers is needed for mass movement of materials, or a special salvage operation is desired, this system provides the necessary administrative machinery, and regulates the segregation of the cost. Covering such a wide range of application, the work order system has afforded easy and proper control of all kinds of service work at lowest indirect cost.

The three forms used to maintain this control are shown on pages 82 and 83. In sequence of usage they are: (1) Request for work order, (2) work order, and (3) work order register. Their applications follow.

While the details of application are presented from the viewpoint of abstract routine, the underlying reasons for such routine, and the efficient results obtained, ought to be self-evident. Their use assures the retention of sound management principles with a minimum of paperwork.

REQUEST FOR WORK ORDER *(5x8 inches, issued in duplicate).* All new work of any nature whatsoever, and all repair work costing over $10, must be authorized through the use of this form. Repair work under $10 is covered by standing or annual orders not included in this system.

Each of the 30-odd department heads is provided with blank forms used to order work. No oral orders are accepted. All items on the request form except its number (which is blank) and the estimate of cost are filled in by department heads. The several ruled lines for "Work to be done by . . ." indicate the various engineering crafts that are involved.

Every request for work order is sent to the plant engineer's office for review of details, calculation of cost estimate, and editing of a recommendation for doing the job. From there it goes to the plant manager for approval. It is then referred back to the plant engineer's office for preparation of the work order, and finally is filed away. A copy of each request is retained by the requestor.

WORK ORDER *(5x8 inches, issued in quintuplicate).* Format of this form so closely duplicates the request form that the work of its issuance is reduced practically to clerical routine once the formalities of approval of the request have been concluded. Five different-colored copies are made up in the plant engineer's office and disposed of as follows:

1 and 2 (white and pink copies). Separate sets are issued for each craft involved in carrying out the order. A single request could conceivably result in work orders to each of the three maintenance foremen over the various crafts, and to any of the three other foremen over machine shop, pattern shop, and labor gang. For convenience in taking care of these possibilities, extra unnumbered sets of white and pink blanks are available. The same master order number already printed on the original set is typed on the extra sets. This same number also is cross-indexed on the request before it is filed away.

After their preparation, all pink and white sets of work orders are sent to the maintenance office, where the pink copy is assigned to the foreman, and the white is filed numerically in a central office file. When the job is completed and checked by the foreman, he enters "Date Completed" on his pink copy, and turns it in to the maintenance clerk. She in turn transfers this date to the white copy, which is then returned to the plant engineer's office. The pink copy is retained in a numerical file for about one year, for further reference.

3 (yellow copy). This form is placed in numerical order in a clip-binder of "active" jobs, kept on the plant engineer's desk. It provides thumb-nail specifications of the job for ready reference. When the "completed" white copy is returned to this office, the yellow copy is removed from the "active" binder, dated, and permanently filed. The white copy is then sent to the cost accounting department.

4 (blue copy). This copy is sent to the department head who requested the work, to apprize him of the action taken and give him a means for identifying the job.

5 (Buff copy, folded and double-size to include section for posting costs). The cost accounting department uses this copy for accumulation of labor and material costs. These costs are machine-tabulated at the end of each month from time cards and requisitions, and posted to the buff copies. Amounts of invoices for materials directly chargeable to any job are also posted here.

When the "completed" white copy reaches the accounting office, it acts as a signal to close out the buff copy. Each month a summary of costs for each work order is sent to both the plant engineer and the plant manager for review of cost performance against the original estimate.

WORK ORDER REGISTER *(8x11½ inches).* The purpose of this record is threefold: (1) To provide the plant engineer with a complete summary of all work in his department, (2) to show what craft is doing what work, and (3) to indicate quickly what jobs are open, and yet to be done. This record is kept in a loose-leaf binder on the plant engineer's desk.

Every work order must be accounted for in this register, even if it is "spoiled" in the making in clerical routine. This guarantees no possible oversight of any order. Separate lines are used for entry of each work-order subdivision to each craft. When each "completed" white copy is returned by the maintenance office, the date is entered as shown under "Date Closed." No work order can possibly be considered closed until all crafts have reported completion.

Every Month . . .

AMONG THE ADVERTISING PAGES, these valuable aids to low-cost production: the plant operation man's guide to **WHAT'S NEW IN EQUIPMENT** (page 136) . . . a summary of **LABOR DEVELOPMENTS** (page 212) . . . things **YOU WANT TO KNOW** more about (page 202)

METHODS MANUAL FOR SMALL SHOP

H. H. ALDEN • CHAIRMAN OF METHODS COMMITTEE, AMERICAN WELDING & MANUFACTURING COMPANY, WARREN, OHIO

PROBLEM—*poor instructions.* It's the same problem many, many plants face. We faced it two years ago at American Welding.

We found that considerable time was being lost in handling an order, an estimate, a request for information, or some other important everyday detail of operation—all because instructions were not generally understood. Often delays arose from misdirection, or time was lost while interested parties debated the proper method or procedure to follow in a given instance.

When a new employee reported for work, he was instructed in the routine of his own job and soon gained a working knowledge of affairs within his own department. But often he got conflicting opinions when he encountered a new situation or one involving another department.

SOLUTION—*a procedure book.* In the minds of most of us, "procedure" immediately spells red tape. Let me say at this point that our whole approach was one of simplification. One of the advantages of gathering into a single record the various steps and procedures used in an organization is the ability to see more clearly the over-all company effect of various activities. Thus duplication of effort is eliminated and activities are centered where they can be most effectively accomplished.

THE SITUATION. Ours is a small business. We make welded steel parts. The products are generally produced to customers' specifications, although our engineering department can many times assist customers in developing a more economical design. The different parts made in one year number in the thousands. Circular shapes are most common, but built-up weldments are also an important part of total output.

Our company is large enough for departmental organization, but is not of a size to justify a methods and procedure department. It was not our purpose, therefore, to impose on existing departments a new set of rules prepared by a separate methods department, but to collect and produce in a more usable form the instructions already developed and issued by executives and department heads. Our major objective was the establishment of a permanent record lending itself to systematic filing and ready reference. We wanted a book simple in organization, practical in use, and adaptable to change.

Set forth below are the steps by which we achieved our purpose:

1. ***Whose responsibility.*** The assistant secretary was assigned the responsibility for preparation of the "Procedure Book."

2. ***What form.*** We decided to use a looseleaf, seven-ring binder to accommodate 8½x11-in. pages. The binders were imprinted with the title "Procedures" and the company name. Pages for insertion in the book were pre-printed with a uniform heading on stock suitable for a gelatin-type duplicator.

3. ***Who should have copies.*** We prepared a list that included officers, department heads, plant foremen.

4. ***Collecting Data.*** Each department head was requested to review and forward interoffice memos, instructions issued, or similar data to the assistant secretary. To achieve uniformity, it was necessary to edit and rewrite a number of the procedures. Those not in actual use were dropped; others were brought up to date. Where practical, personnel were referred to by title. This removed a later need for revising or reissuing a procedure in the event of personnel change.

5. ***Arrangement of book.*** The book was divided into sections partly to aid in establishing a record of departmental functions and partly for reference purposes.

6. ***Description of book sections.*** Four book sections cover matters common to all departments. These sections are titled: Index, General Policy, General Procedure, Standing Committees. The index is in two parts. Index 1 exhibits a plan of the book by sections. Index 2 is an alphabetic listing of titles with reference to book section and procedure number.

The policy and procedure sections, as their titles imply, deal with general instructions. The standing-committees section names each committee, the members and chairman, purpose and functions, and to whom the committee reports.

The remaining book sections bear names of company departments. Departmental sections contain:

a. Title of the department head, title of his superior, and functions of the department.

b. An organizational chart, designating positions by title.

c. A list of salaried personnel, including their titles.

d. Procedures that the department originates or for which it is chiefly responsible.

7. ***Making Revisions.*** Procedures may be originated or changed either by action of an appropriate committee or by action of a department head within whose province the particular responsibility lies. This is simply accomplished by forwarding the procedure in detail to the assistant secretary.

While it is true that the original compilation of the book entailed both time and concentrated effort, we now find that little time or effort is required to keep it up to date. As omissions or changes come to our attention, we handle them quite simply by preparing revised or new pages.

At present the book runs somewhat one-sidedly to clerical routines. The inclusion of additional operating procedures for the plant will correct this and make the book more useful.

FACTORY'S
FOURTH ANNUAL SURVEY
OF
WORKER OPINION

WHAT THE FACTORY WORKER REALLY THINKS

ABOUT HIS JOB; UNEMPLOYMENT; AND INDUSTRY'S PROFITS

THE BATTLE for worker understanding and loyalty is in full swing. Damaging misconceptions are still current despite the best efforts of some managements to present clear, accurate pictures of industry's economic position. The only possible conclusion: *Management has made gains on some fronts, but has not held its own on others.* This is the danger sign emphasized by the facts in this report.

But there are hopeful signs, too. Workers are still basically individualists. They are challenging management to place them on incentive. They want a man to have a chance to earn his way on the basis of performance. They think the general economic picture is pretty good.

It adds up to this: *Workers want to be on management's side.* Their natural inclinations are in that direction. Management, by word and by example, must give workers every opportunity to exercise those inclinations to the full.

●

This article is the second of two based on FACTORY's fourth annual survey of "What the Factory Worker Really Thinks." The survey was conducted for FACTORY by the McGraw-Hill Research Department, making use of the most modern sampling techniques to determine group opinion. Interviews were made in every part of the United States. Accuracy of this new poll was insured by allotting interviews in proportion to geographical concentration of manufacturing workers, type of industry, size of plant, union membership, age group, and sex. FACTORY believes the survey is representative of current opinion of non-supervisory factory employees throughout the nation. This continuing service is presented in the interest of greater understanding between management and labor, and hence of greater industrial efficiency and national prosperity.

SUMMARY OF WORKER OPINION

HIS JOB

1 Workers have not changed their minds about employers being sincerely interested in them . . . but they *still* consider union leaders their real friends

2 Four out of five workers who get paid on an incentive or bonus basis feel that the system is fair in their plant . . . and half of those who are not paid on this basis would like to be

3 Workers think performance is of first importance when it comes to raises and promotions . . . and they definitely disapprove of union demands that seniority be the only consideration

4 Only one man in five feels his work is too monotonous, but one woman in three thinks hers is

UNEMPLOYMENT

5 One worker in three expects unemployment to increase in the year ahead . . . half are sure there is no economic slump coming . . . and less than one worker in twelve expects a layoff in the next six months

6 Most workers think a depression would make wage rates go down . . . and almost as many believe companies would use a depression as an excuse to lower wages . . . reduced living costs would help most to prevent a depression, but few workers think a new OPA is the answer

INDUSTRY'S PROFITS

7 Workers are less certain than last year as to what is a fair return on investment . . . but stories of inflated profits have made one worker in five think industry is earning 25 per cent or more

1 Workers have not changed their minds about employers being sincerely interested in them...

DO YOU FEEL THAT THE HEAD MEN OF YOUR COMPANY HAVE THE WORKERS' INTERESTS AT HEART; OR DO YOU FEEL THEY ARE NOT MUCH CONCERNED WITH WHAT HAPPENS TO WORKERS?

ANSWERS	NOVEMBER, 1944			NOVEMBER, 1947		
	ALL WORKERS	NON-UNION	UNION	ALL WORKERS	NON-UNION	UNION
Have interests at heart	56%	68%	51%	55%	63%	52%
Not much concerned	35	26	40	39	31	42
No opinion	9	6	9	6	6	6

...but they *still* consider union leaders their real friends

WHO WOULD YOU SAY IS MORE INTERESTED IN THE PERSONAL WELFARE OF THE WORKING MAN—THE HEADS OF YOUR COMPANY OR THE UNION LEADERS?

Company heads	25%	47%	14%	26%	47%	17%
Union leaders	47	21	60	47	23	57
★No difference	17	13	18	23	19	24
No opinion	11	19	8	4	11	2

★This answer was volunteered (i.e., respondents were offered only a choice between "company heads" and "union heads")

● In the three years since FACTORY first asked these questions, there has been *no significant change* in worker opinion. But there are sharp variations. The breakdown by union and non-union groups is shown above. Among members of independent unions, 63 per cent feel head men of the company have workers' interests at heart (same figure as non-union workers), compared with 54 and 48 per cent, respectively, for AFL and CIO. This same response comes from 69 and 61 per cent of the workers in the South and West; in the other three sections the figure is 51. The group of workers over age 55 shows 64 per cent believing company heads are interested in what happens to their employees. Variations by size of plant are too small to be significant.

On the question of who is more interested in worker well-being, members of the CIO register the lowest vote (13 per cent) in favor of "company heads." AFL and independent groups show 20 and 21 per cent, respectively. Regionally, the South shows the only significant variation, with 41 per cent saying "company heads," compared with 21 to 25 per cent in each of the other sections. As workers grow older they are more likely to say "both equally interested." The score is 32 per cent in the 55-and-over group, compared with 19 per cent in the 20-34 age group, and 23 per cent in the intermediate group.

Variation by plant size is not conclusive, but note the pattern. Per cent saying "company heads": Up to 100 employees, 31; 101-250 employees, 28; 251-500 employees, 25; and over 500 employees, 23.

Considered in the light of the known improvement in many companies, the replies show that other companies have lost ground since 1944 in the vital battle for employee understanding.

GEOGRAPHICAL SECTIONS BY STATES ARE AS FOLLOWS:

NEW ENGLAND—Conn., Me., Mass., N. H., R. I., Vt.

MIDDLE ATLANTIC—N. Y., N. J., Pa.

EAST-NORTH-CENTRAL—Ill., Ind., Mich., Ohio, Wis.

SOUTH—Ala., Ark., Del., Fla., Ga., Ky., La., Md., Miss., N. C., Okla., S. C., Tenn., Tex., Va., W. Va.

WEST—Ariz., Calif., Colo., Iowa, Idaho, Kan., Minn., Mo., Mont., Neb., N. D., N. M., Nev., Ore., S. D., Utah, Wyo., Wash.

CONTINUED ON NEXT PAGE

2 Four out of five workers who get paid on an incentive or bonus basis feel that the system is fair in their plant . . .

DO YOU BELIEVE THAT THIS SYSTEM IS FAIR IN YOUR PLANT?★

★Asked only of the 30 per cent of factory workers who said they are paid on an incentive or bonus basis

. . . and half of those who are not paid on this basis would like to be

WOULD YOU LIKE TO WORK UNDER SUCH A SYSTEM IF IT WERE RUN FAIRLY?★

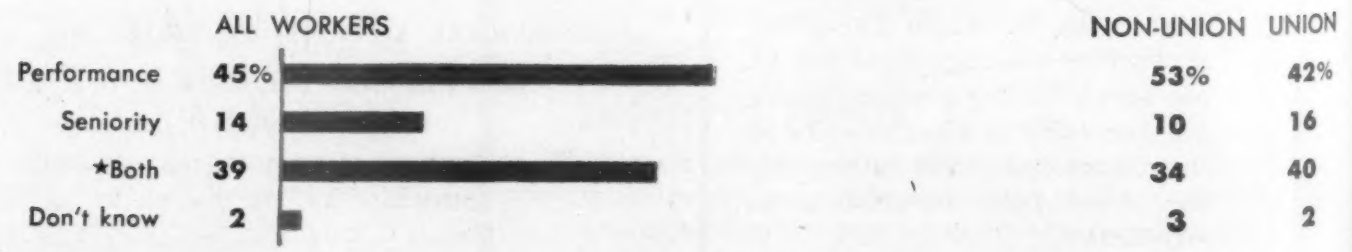
★Asked only of the 68 per cent of workers who said they are *not* paid on an incentive or bonus basis (2 per cent said "don't know" to this "classification" question)

● FACTORY tabulated returns to its survey by 18 groups: Union, 4; plant size, 4; geography, 5; age, 3; sex, 2. In only three of those 18 groups were more than one-fourth of the respondents dissatified with the fairness of the incentive system in their plant. These were: CIO, 32 per cent; the heavily CIO East-North-Central section, 33 per cent; and workers in plants of over 500 employees, 27 per cent. Most satisfied with the incentive system in their plants were workers in the South (90 per cent), in plants with less than 100 employees, and in the AFL (89 per cent each).

The 53 per cent of workers who are not on incentive but want to be, constitute a real challenge to management—and to those unions which stand in the way of introducing incentive systems. In only four groups is there less than a clear majority who want to be on incentive: AFL, 49 per cent; independent union members, 48 per cent; East-North-Central states, 46 per cent; and workers over 55 years of age, 49 per cent.

3 Workers think performance is of first importance when it comes to raises and promotions . . .

DO YOU THINK A MAN SHOULD GET WAGE INCREASES AND PROMOTIONS BASED ON HIS PERFORMANCE OR ON SENIORITY?



★This answer was volunteered (i.e., respondents were offered only a choice between "performance" and "seniority")

...and they definitely disapprove of union demands that seniority be the only consideration

SOME UNIONS STATE THAT WAGE INCREASES AND PROMOTIONS SHOULD BE BASED ON SENIORITY ONLY. DO YOU APPROVE OR DISAPPROVE?

● Just short of a majority (45 per cent) of all workers believe that wage raises and promotions should be based on performance alone. Significantly, another 39 per cent of workers refused to mention either "performance" or "seniority"; they insisted on FACTORY's interviewers recording "both," even though that choice was not offered in the wording of the question. Had the question been worded in such a way as to offer a three-way choice, it seems probable that some, and perhaps many, of those who answered with a definite "performance" or "seniority" might have chosen the third alternative and said "both."

However, the replies can be added to give this certain interpretation: 84 per cent of workers believe performance should be considered; only 53 per cent want seniority considered.

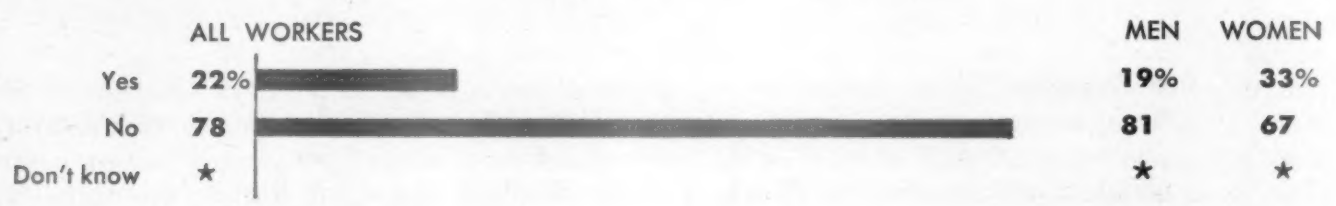
If more proof is needed that workers think performance is important, it is provided in the second of these two questions. By almost 5 to 1 workers reject the proposition that increases and promotions should be based on seniority alone. This, despite the fact that the wording of the question labeled seniority as "union policy." Comparison of the two questions shows that this phrase had a definite effect upon the answers. Only 14 per cent said "seniority" (plus 2 per cent "don't know") on the first question; yet on the second question, 17 per cent approved the union policy of demanding that raises and promotions be based on seniority alone (and 4 per cent entered the "don't know" column).

Greatest approval of union seniority policy was voiced by workers over 55 years of age (25 per cent), in the West (24 per cent), and in CIO (22 per cent).

4

Only one man in five feels his work is too monotonous, but one woman in three thinks hers is

DO YOU THINK THAT YOUR WORK IS TOO MONOTONOUS?



★Less than ½ of 1 per cent

● Second only to women in believing their work is too monotonous are workers in the East-North-Central states (29 per cent); third are members of the CIO (27 per cent). Least bothered are members of independent unions and workers over 55 years old; only 15 per cent of them think their work is too monotonous.

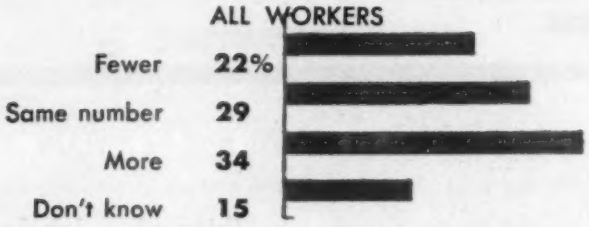
Results on this question spell out the fact that management, on the whole, is doing a good job of making work interesting for employees. Companies engaged in assembly-type work seem to be a mild exception. Assembly is the more-or-less "common denominator" which links women, East-North-Central, and CIO.

Recurrent criticism of the monotonous nature of work in manufacturing is shown by these figures to have little basis in fact. Work may, in fact, be monotonous; the question is not worded to measure that. The point is that a whopping majority of workers feel that their job is not *objectionably* monotonous. In other words, those who cite surveys that show significant percentages of workers simply stating that their work "is" monotonous have not gone far enough. Apparently there are many workers who *like* simple, repetitive work; who have no desire for "original" work, or for responsibility.

CONTINUED ON NEXT PAGE

5 Only one worker in three expects unemployment to increase in the year ahead . . .

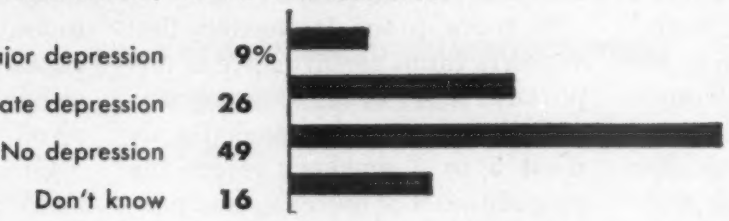
HOW MANY PEOPLE DO YOU THINK WILL BE UNEMPLOYED A YEAR FROM NOW AS COMPARED WITH TODAY?



	ALL WORKERS	NON-UNION	UNION
Fewer	22%	23%	21%
Same number	29	29	29
More	34	28	37
Don't know	15	20	13

. . . half are sure there is no economic slump coming . . .

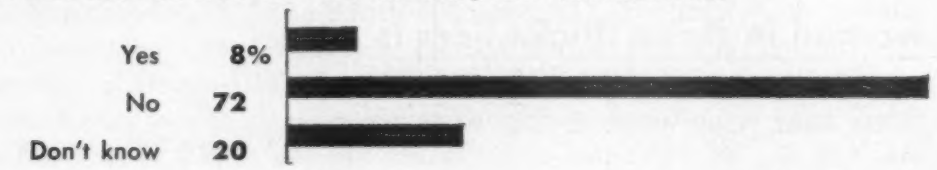
DO YOU THINK THAT WITHIN THE NEXT YEAR WE'LL HAVE A MAJOR DEPRESSION, A MODERATE DEPRESSION, OR NO DEPRESSION?



Major depression	9%	10%	8%
Moderate depression	26	25	27
No depression	49	46	50
Don't know	16	19	15

. . . and less than one worker in twelve expects a layoff in the next six months

DO YOU THINK YOU MAY BE LAID OFF WITHIN THE NEXT SIX MONTHS?

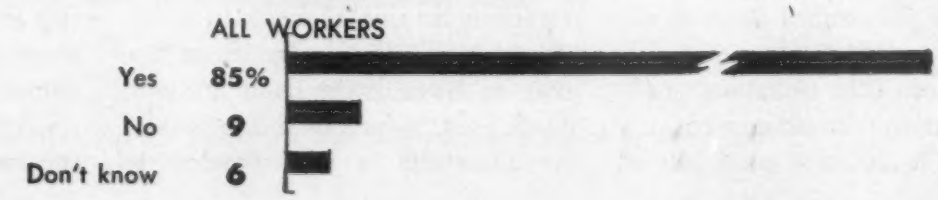


Yes	8%	9%	8%
No	72	69	73
Don't know	20	22	19

● Organized labor leaders have failed to convince the rank-and-file that anything is going to bring about a new depression. Middle Atlantic workers are most optimistic: 31 per cent expect fewer unemployed next year; however, 11 per cent of the Middle Atlantic group expect a layoff in the next six months. In no other section does this figure exceed 8 per cent; in the South it is only 5. Sixty per cent of workers in the West expect no depression in the next year (highest vote in any group); yet 39 per cent of this same group expect more unemployed a year from today (also high). These apparent contradictions add up to one thing: *High-powered propaganda has many workers confused about the economic picture.* Despite this confusion, the general level of optimism is high.

6 Most workers think a depression would make wage rates go down . . .

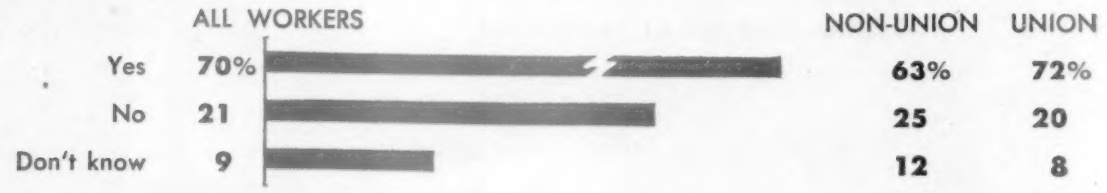
DO YOU THINK A DEPRESSION WILL MAKE WAGE RATES GO DOWN?



	ALL WORKERS	NON-UNION	UNION
Yes	85%	84%	85%
No	9	9	10
Don't know	6	7	5

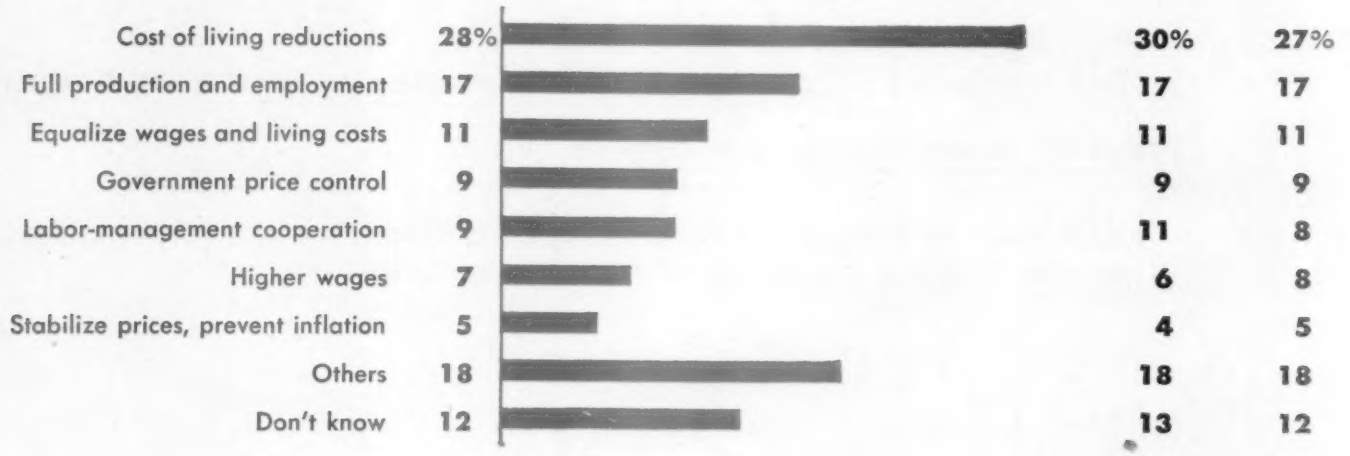
...and almost as many believe companies would use a depression as an excuse to lower wages...

DO YOU THINK MANY COMPANIES WOULD USE A DEPRESSION JUST AS AN EXCUSE TO LOWER WAGES?



...reduced living costs would help most to prevent a depression, but few workers think a new OPA is the answer

WHAT DO YOU THINK WILL HELP MOST TO PREVENT A DEPRESSION?★


Cost of living reductions 28% 30% 27%
Full production and employment 17 17 17
Equalize wages and living costs 11 11 11
Government price control 9 9 9
Labor-management cooperation 9 11 8
Higher wages 7 6 8
Stabilize prices, prevent inflation 5 4 5
Others 18 18 18
Don't know 12 13 12

★All replies were volunteered (i.e., respondents were not offered a choice of possible replies). Figures total more than 100 per cent because of multiple answers

● There is practically no significant variation in workers' belief that a depression will cause wage rates to drop. The most optimistic (Middle Atlantic, 82 per cent "yes") differed by only 8 per cent from the least optimistic (South, 90 per cent "yes").

But workers in the South are also most hopeful about companies "using" a depression as an excuse to lower wages (30 per cent said "no"). Studied together, these two questions show that there is a small but important group of workers who believe their companies will fight to keep any cuts to a minimum.

Workers' suggestions for preventing a depression show virtual unanimity among all union, nonunion, age, plant size, and sex groups. But the variations by geographical region are the greatest shown on any question. Thirty-four per cent of New Englanders stress cost of living reductions (average, 28; West, 20), but only a negligible percentage of them think this should be accomplished through government price control (average, 9; West, 14). Seventeen per cent of Southern workers think wages and living costs should be equalized (average, 11; New England, 5), but only a handful think that wage boosts *alone* are the answer (average, 7; Middle Atlantic, 11).

Workers in the East-North-Central section appear most resigned to present high costs; 8 per cent of them say simply "stabilize prices, prevent inflation." In no other section did more than 5 per cent suggest this.

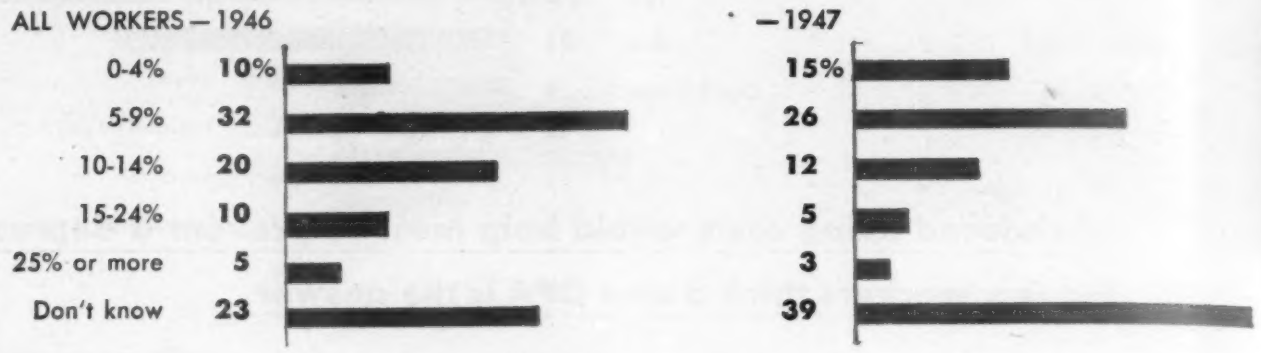
One thing that should be encouraging to management is that 17 per cent of all workers (the second largest total) suggest that "full production and employment" is the best cure for a possible depression. The variations on this answer were not so marked as on some others—from 14 (East-North-Central) to 25 per cent (New England).

"Others" included such items as "discontinue help to Europe" (4 per cent), "increase foreign trade" (3 per cent), "limit production," "reduce taxes," and "less government interference." One item was conspicuous by its near-absence. Despite all the yelling labor leaders and labor's "economic experts" have been doing for the past two years, only 2 per cent of workers mentioned "reduce profits" as a possible means of preventing a depression. Even among CIO members, whose leaders have been most violent on this subject, the item was mentioned by a bare 3 per cent.

CONTINUED ON NEXT PAGE

7 Workers are less certain than last year as to what is a fair return on investment . . .

IF YOU PUT $5000 INTO A COMPANY, ABOUT WHAT PER CENT RETURN WOULD YOU EXPECT EACH YEAR?★



. . . but stories of inflated profits have made one worker in five think industry is earning 25 per cent or more

ABOUT WHAT PER CENT RETURN EACH YEAR DO YOU THINK OWNERS OR STOCKHOLDERS ARE NOW RECEIVING ON THE MONEY THEY HAVE INVESTED?★

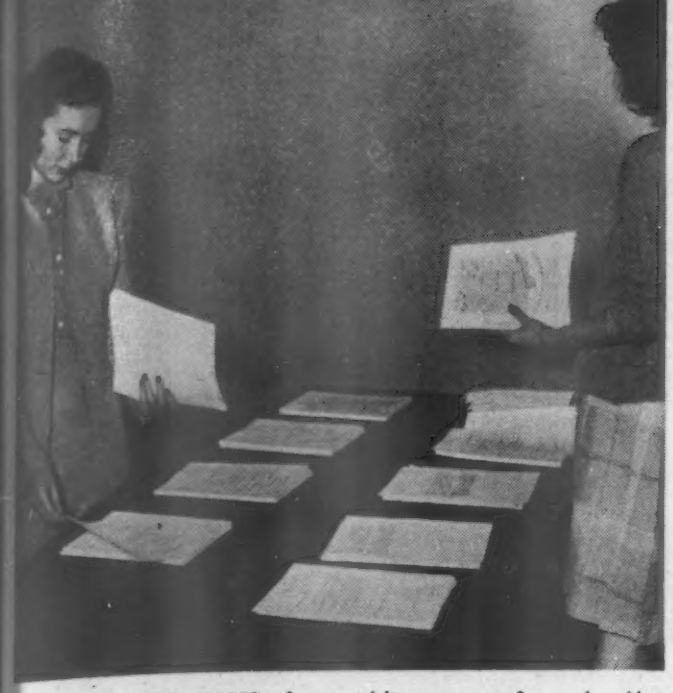
	ALL WORKERS	NON-UNION	UNION
0-4%	9%	11%	8%
5-9%	12	13	12
10-14%	7	7	8
15-24%	7	5	8
25-49%	10	6	11
50-100%	8	8	8
Over 100%	1	1	1
Don't know	46	49	44

★All replies were volunteered (i.e., respondents were not offered a choice of possible replies). Most replies were specific figures; they have been grouped within significant ranges for easier interpretation

● Last year, when workers were asked what they considered a fair return on investment, their answers showed a great lack of understanding of the "economic facts of life." By and large, that lack of understanding still exists. But there are two signs that a change has taken place. Among those who have some definite idea of what return they would expect, the expectations are more modest this year. The number who expect less than 5 per cent has grown markedly; the number expecting more than that has shrunk all the way along the line. Such results may well indicate that management's efforts to give workers economic facts are at last beginning to pay off.

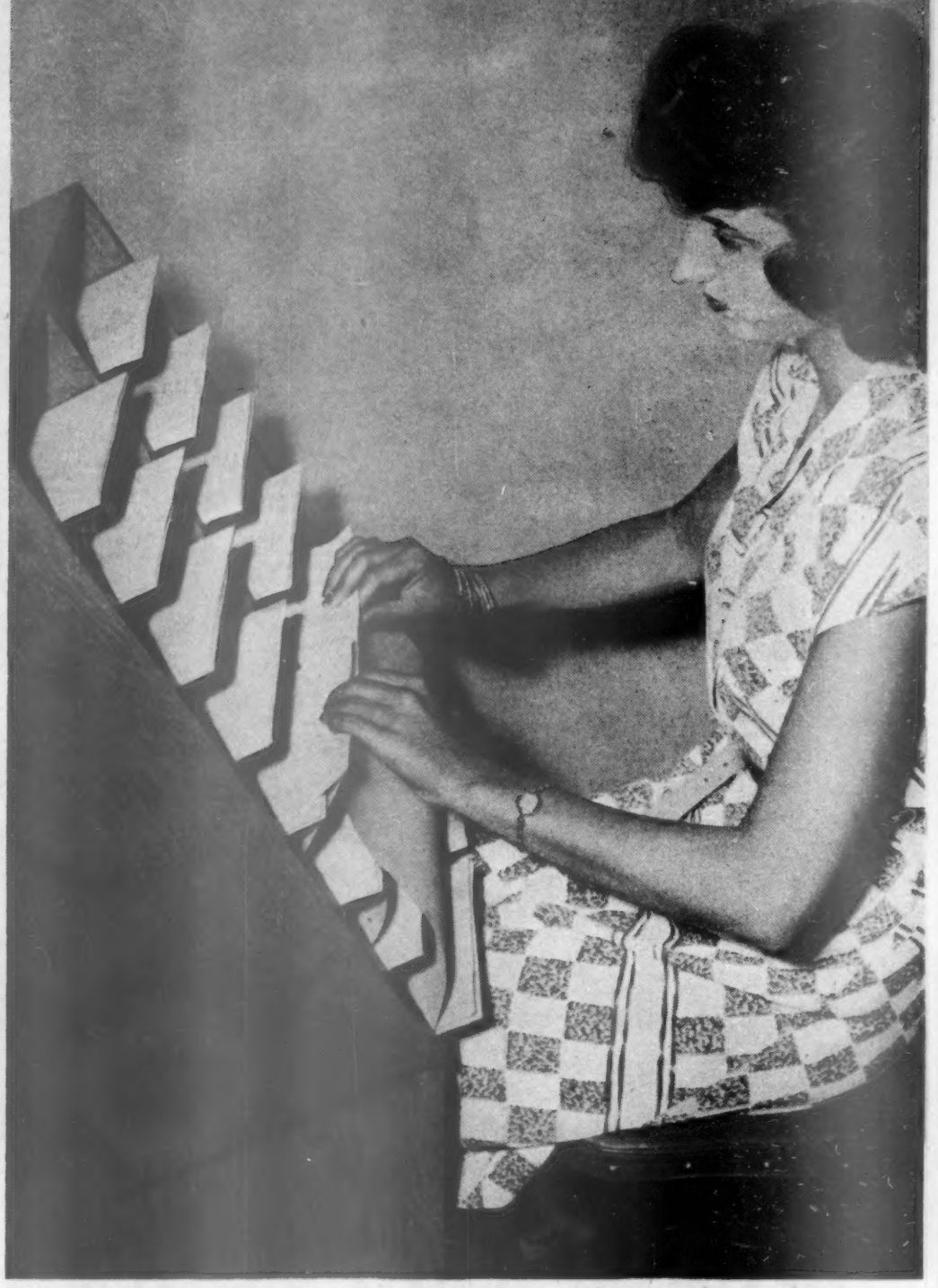
The fact that a far larger percentage than last year "don't know" may indicate the same thing. But it may also be indicative of the confusion created by union propaganda about excessive profits. That this propaganda has made its mark is proved by the replies to the question about stockholder earnings. Close to a fifth of all workers believe that industry is earning over 25 per cent on its investment. In New England, 6 per cent of the workers think that investors in industry are earning *in excess of 100 per cent a year.*

This adds up to the fact that management still has a big educational job to do. Failure to do this job has left workers "wide open" to all union organizers' claims of "exploitation," "boom-and-bust philosophy," "inflated profits," and "economic royalist." It is a dangerous challenge. It is more dangerous unheeded.



OLD WAY of assembling pages for a booklet was to walk, walk, walk. Good for the figure, no doubt, but certainly hard on the feet

BETTER METHOD employs metal devices with V in middle. Clerk sits down, squeezes two fingers, picks up two sheets. Assembly time halved



STILL BETTER WAY involves sorting cabinet that cost $10.56. Movements simultaneous. Both hands productive. Thumb and index finger hold while middle finger rakes off new sheet. As hands move up cabinets, sheets are slowly pulled out

MOTION STUDY SLASHES OFFICE MAN-HOURS

HOMER SMITH • TRAINING SUPERVISOR, TERMINAL ISLAND NAVAL SHIPYARD, SAN PEDRO, CALIF.

FOR good hunting, methods men are advised to try the office. Application of work simplification principles to routine clerical jobs will yield big dividends.

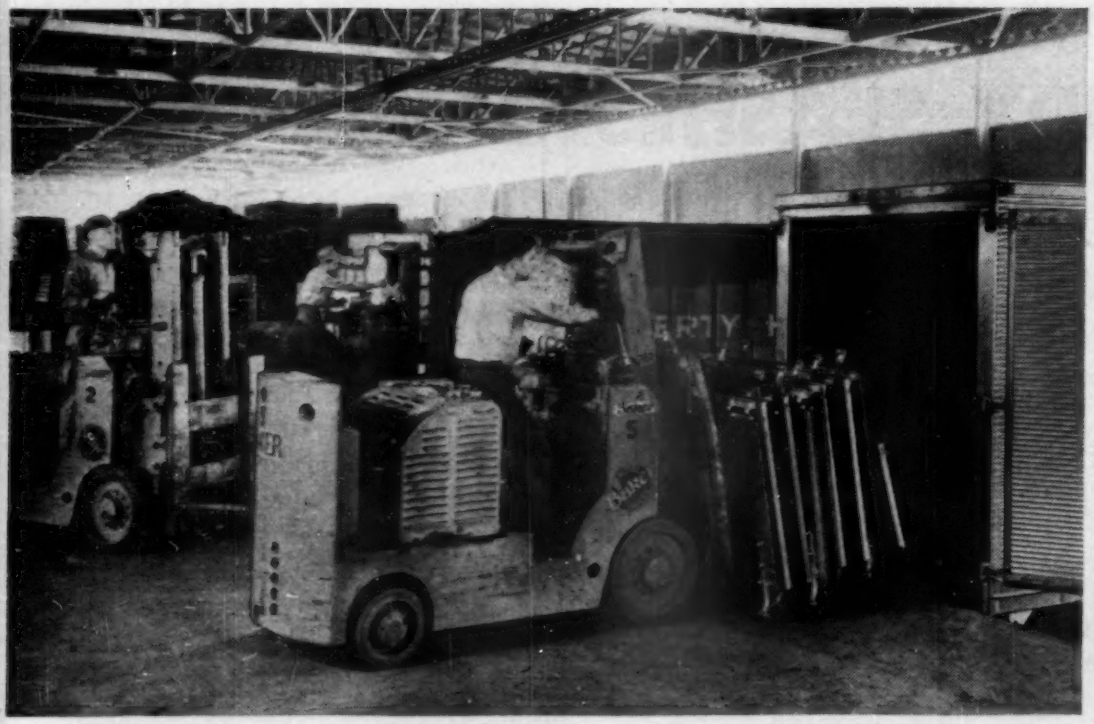
For instance, take the not unusual job of collating sheets for a booklet. The photographs show the development of the method now in use at the Terminal Island Shipyard.

It began as the old, familiar job in which the operators walked up and down, picking up sheets one at a time. Then an alert training section dreamed up a metal sheet holder with a *V* sticking up in the middle. Assembly time was cut in half when this was used.

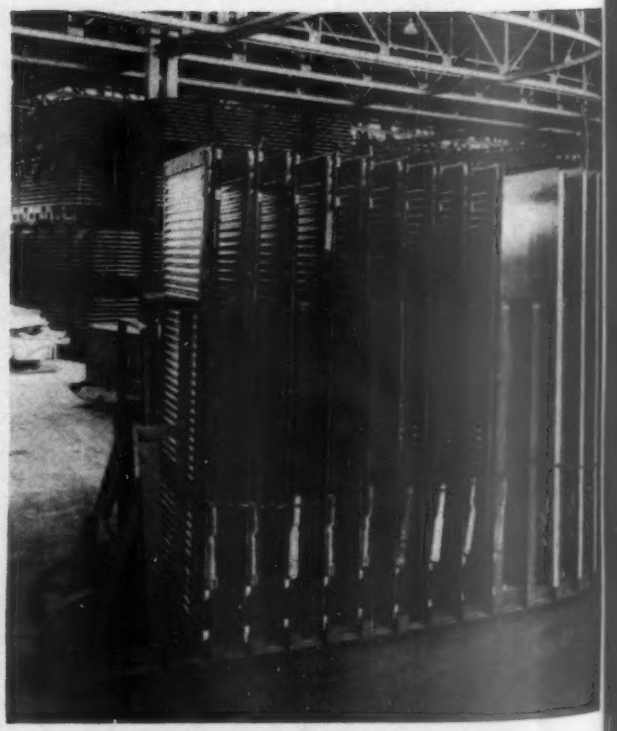
It was a big improvement, but it wasn't good enough! Someone doped out a simple sorting cabinet —see the photograph for details of how it works. It cost only $10.56 —and on a single job involving the assembly of 500 books of 400 approved practice sheets each, it saved 65 man-hours.

BACKGROUND, PLATFORM LIFT TRUCK (ONE OF THREE) STACKS TOTEBOXES FOUR HIGH. FOREGROUND, FORK LIFT TRUCK (ONE OF SIX)

POWER TRUCKS RAISE EFFECTIVE



FORK TRUCKS handle incoming parts and materials. Some items, as here, are handled directly on the forks. Some arrive strapped to skids. Still others are palletized



FOR LONG HAULS in half-mile-long plant, special dollies (one is shown here)

PICKS UP LOAD OF ALUMINUM SHEETS

TRUCK UNITS IN FRUEHAUF FLEET

NO.	TYPE	CAPACITY	HEIGHT OF LIFT	USE
6	Fork lift	3 tons	10 feet	Unloading from freight cars and trucks and stacking in raw-materials storage area
3	Platform lift	3 tons	8 feet	Stacking tote boxes and transporting material to assembly
5	Coupler trucks	—	—	Moving trailers inside plant
1	Shop mule	3 ton winch	—	Maintenance use only
3	Tractors	1½ tons	—	Hauling trailer from end of line to yard storage
1	Shop Tractor	3 tons	—	Transporting dollies for storage of strip steel, doors, etc.

NINETEEN TRUCKS WERE CAREFULLY SELECTED FOR SPECIFIC MOVE JOBS

STORAGE BY 50 PER CENT

or trailer trains are pulled by the useful shop tractor in the Fruehauf fleet

L. H. NILES • PLANT ENGINEER, FRUEHAUF TRAILER COMPANY
AVON LAKE, OHIO

EFFICIENT handling was the goal in planning the new Fruehauf plant at Avon Lake. Especially was this true of the receiving and raw-material storage activities.

Original plans allocated approximately 20 per cent of the 880,000 square feet of floor space to storage requirements. This provided for a 30-day bank of raw materials, which would result in the eventual production of 1500 trailers per month. Mainly because of the efficiency with which raw materials can be unloaded, stacked, and transported to the assembly areas by a fleet of intra-plant trucks, it has now been found possible to store a bank of 45 days' production in the same area. In other words, there has been an increase of 50 per cent in the effectveness of the storage space.

There are 19 trucks in the fleet. A breakdown by type, capacity, height of lift, and use is shown in the table (above).

Needs Carefully Figured

Prior to the construction of the new plant, requirements for handling the estimated 6075 tons of raw material per month (1500 trailers at 4.5 tons each) were

carefully estimated on the basis of the experience at both the Detroit and St. Louis plants. Figures were adjusted for the more efficient layout and facilities incorporated in the new plant.

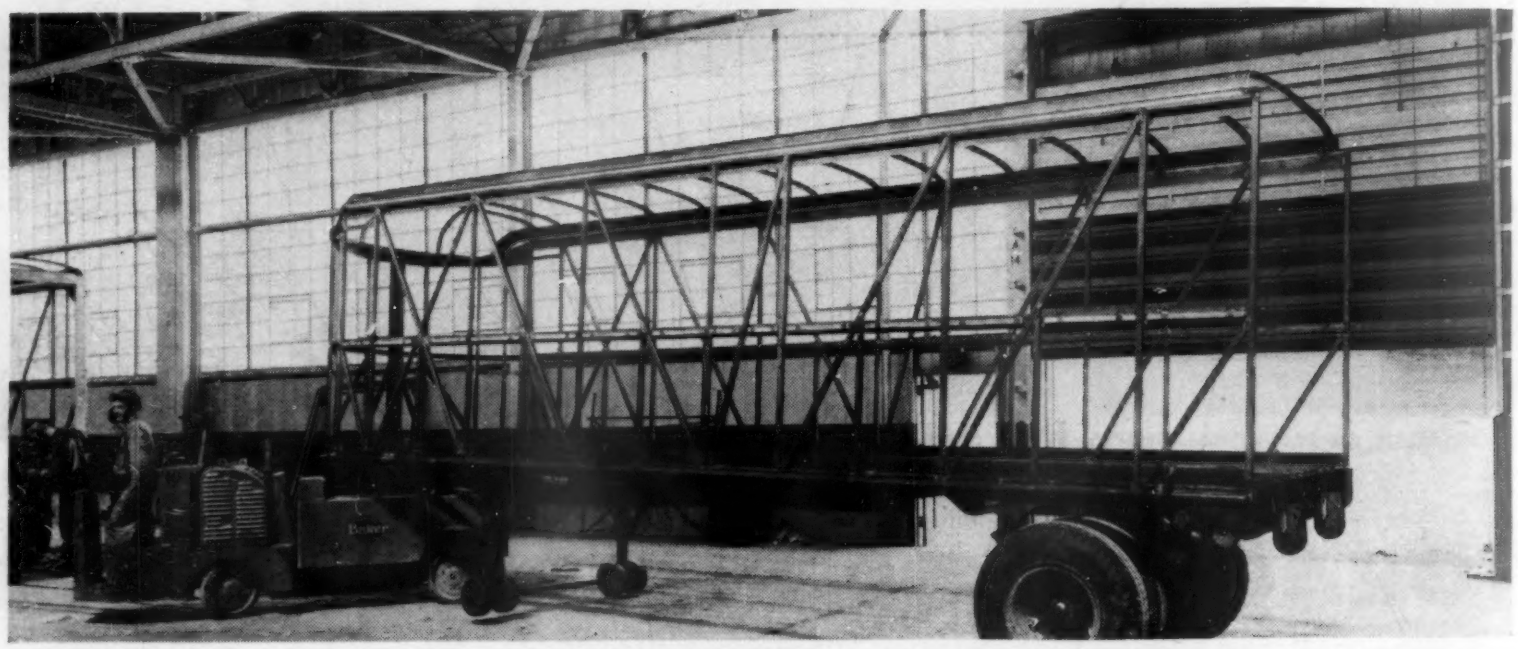
Trucks are assigned as follows: *Frame department* – 1 fork lift truck; *body line*–2 platform trucks; *receiving and storage department*–5 fork trucks; *press room*–1 platform truck; *assembly department*–5 coupler trucks; *maintenance department*–shop mule; *shipping department*–3 tractors; *general use*–shop tractor.

At present trucks are assigned to the above-mentioned departments and are scheduled by department heads. It is expected that when operations are in full swing the truck operations may have to be handled from a central dispatch office.

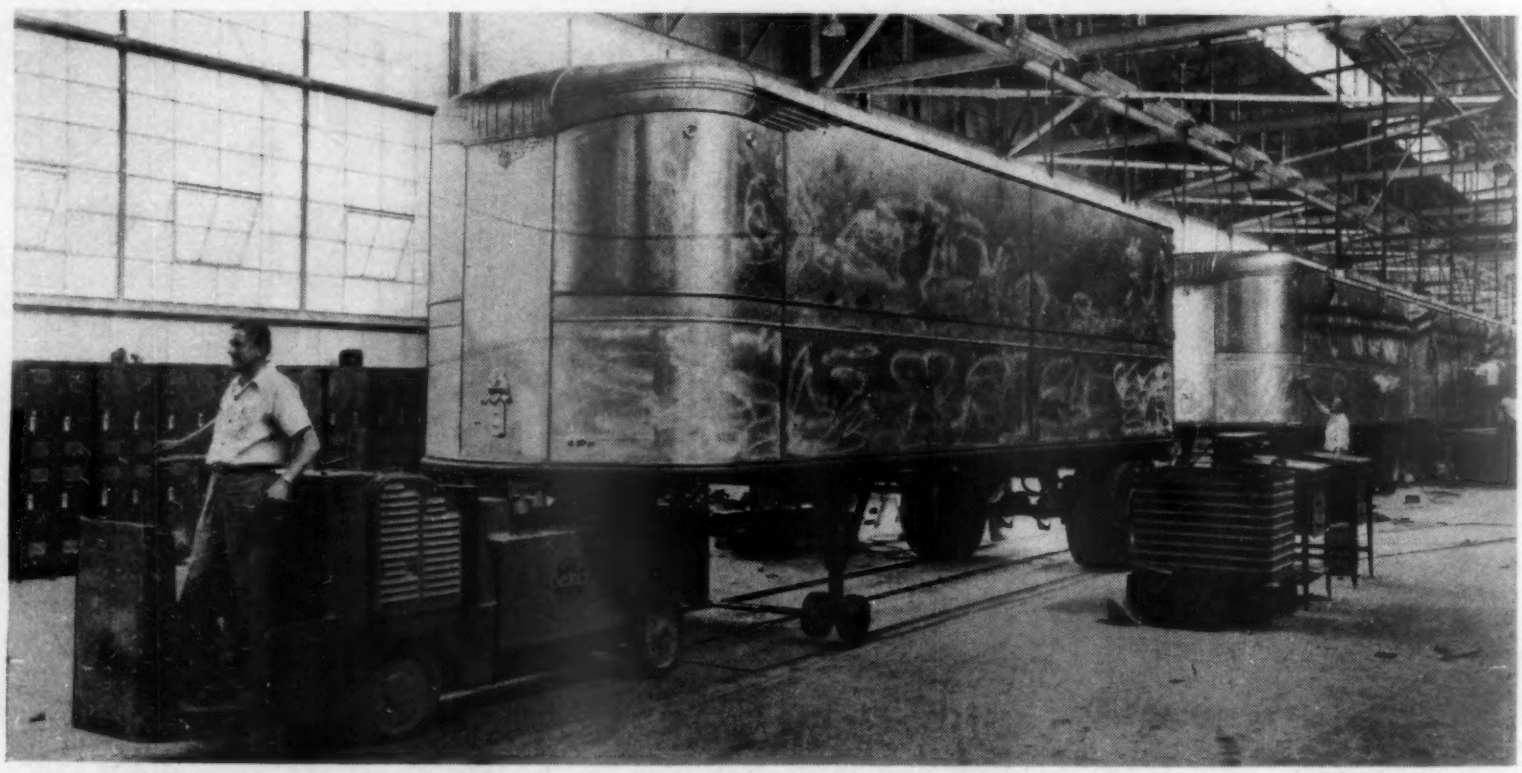
At a central maintenance garage all intra-plant trucks are checked daily for oil, gas, and motor operation. Once each week the gasoline-powered motor generator sets are thoroughly checked, the oil is changed, and the entire unit is greased. Since the motor generator sets are self-contained power units, a spare unit is kept on hand at all times. If any unit in an operating truck breaks down, the spare is substituted immediately and the unit that requires repair is removed and repaired.

Much credit is given the trucks for getting production moving even before the assembly line was installed. By their extreme flexibility, trucks were able to move parts and partial assemblies to proper locations even during the last phases of building erection.

One interesting truck operation is that performed by the coupler truck. At several points in the assembly of the trailer body, the trailer must be removed from the line and transported to the next assembly point. The coupler that engages the trailer is mounted on an elevating platform which permits lifting the front end of the trailer to facilitate moving. Two of these trucks are shown in action in the photographs below.



ONE OF FRUEHAUF'S FIVE COUPLER TRUCKS TRANSPORTS BODY SKELETON CLAMPED TO CHASSIS TO START OF BODY ASSEMBLY LINE



AND ANOTHER COUPLER TRUCK PICKS UP FRONT END OF COMPLETED BODY, MOVES IT, READY FOR PAINTING, TO FINAL ASSEMBLY LINE

PRODUCTION FLOW CHARTS

1. RUBBER TIRES

SEIBERLING RUBBER COMPANY, AKRON

1. Bales of rubber, boxes of synthetic rubber, bags of chemicals, and rolls of fabric arrive at the receiving station.

2. Materials are transported by truck from the receiving storage area to the Banbury mixer in which the rubber, after a preliminary chopping, is mixed with certain chemicals much like the operation of a giant food mixer.

3. In the third operation, rubber is kneaded on the heavy steel rolls of a rubber mill to obtain further blending of components.

4. Tread stock

a. Material for tread stock is fed into pellitizers which chop the rubber into thimble-size pellets which can be blown through an air conveyor system to the mixer operation, thereby eliminating trucking.

b. Pellets are placed in a Banbury mixer for the addition of certain chemicals necessary to the production of tread stock.

c. The output of the Banbury mixer is placed in another mill which further blends the tread stock, warms it, and feeds it on a thin strip to an extruder.

d. In the extruder, rubber is forced in a continuous strip through a die which gives it the final shape of the tread and side wall, and the tread is then sent to the tire builder.

5. Tire beads, shock breaker, and tire plies

a. Rubber for fabric impregnation is conveyed to warm-up and feed mills in which the rubber is mixed to get it into a workable condition. From these mills, a thin strip of rubber is fed to the train calenders.

b. On the train calenders, rayon cord fabric which has been predipped in a latex solution is impregnated with rubber. The latex predipping makes the rubber stick to the slippery rayon.

c. From the calender, rubber impregnated fabric is sent to three basic component lines:

Beads—are constructed on a special machine and are covered with the rubberized fabric before being sent to the tire builder.

Cushion and shock-breaker plies—rubber-impregnated fabric is built into the form of special cushion and shock-breaker plies.

Tire plies — rubber-impregnated fabric to be made into tire plies is cut in a special machine on the bias to give added strength when plies are overlapped.

6. At the tire building station, all material previously produced is fed to the tire builder, who places it on a tire-building machine. The tire builder assembles the various units in their proper order, finishing up with a drum-shaped tire.

7. In a vacuum box, the drum-shaped tire, under vacuum pressure, is pulled into the familiar tire shape. Simultaneously, a hot-water curing bag is rammed into it, and takes the shape of the tire. (This bag is like a heavy inner tube through which hot water can be circulated during the next or curing operation.)

8. In the curing or vulcanizing process, the tire (with its curing bag) is placed in a heated press (similar to a waffle iron) in which tires are cured for periods ranging from 30 minutes to 4 hours. Live steam at 280 degrees is injected into the jacket of the mold, while boiling hot water is circulated through the curing bag. This heat temporarily plasticizes the tread rubber and enables it to assume the tread design on the mold.

FINAL MIXING AND PREPARATION FOR EXTRUSION
WARMUP AND FEED MILLS FOR CALENDER
"CALENDERING" OR IMPREGNATION OF CORD TIRE FABRIC
DIPPING OF RAYON CORD FABRIC

9. Following curing, the curing bag, having performed its function, is removed.

10. During inspection, rubber tits are removed from the tire which were the result of rubber flowing into the expansion ducts in the mold. After the tire passes inspection, it is given its familiar coat of black tire paint, and is wrapped and labeled.

11. Tires are stored in this area prior to final shipment.

12. At this point, rubber has completed its circulation of operation and moves out of the plant by the same spur track from which it has been received

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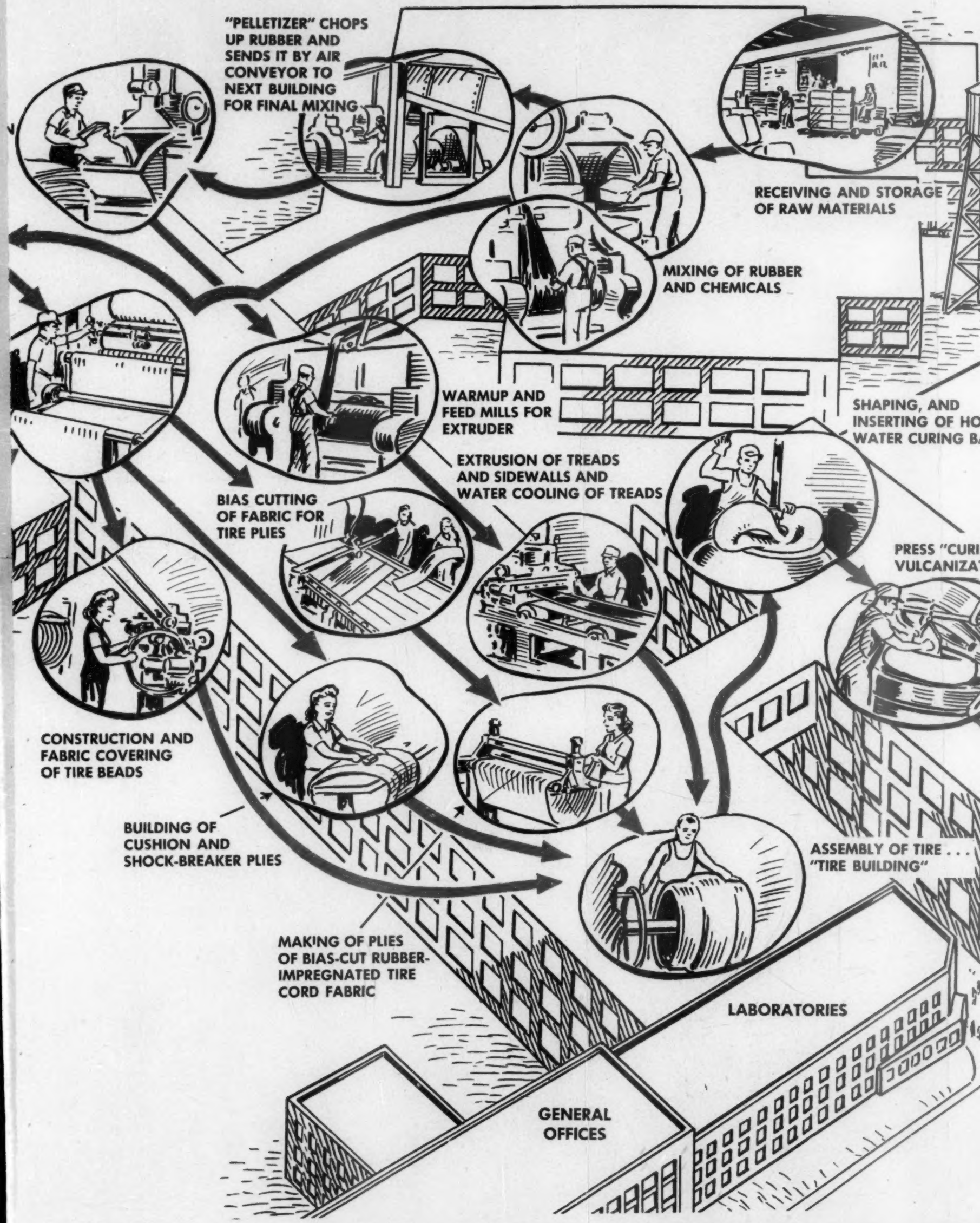
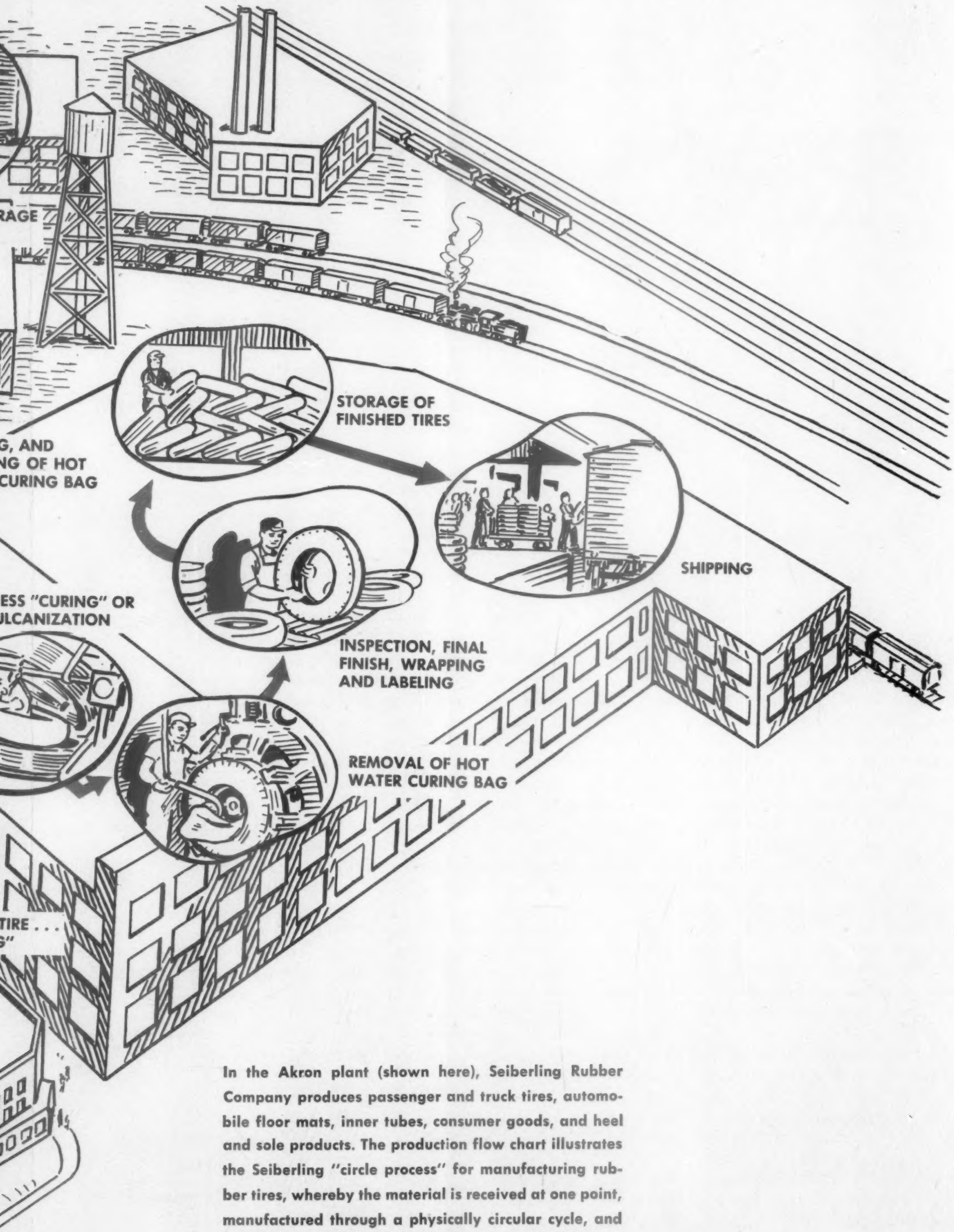

"PELLETIZER" CHOPS UP RUBBER AND SENDS IT BY AIR CONVEYOR TO NEXT BUILDING FOR FINAL MIXING
RECEIVING AND STORAGE OF RAW MATERIALS
MIXING OF RUBBER AND CHEMICALS
WARMUP AND FEED MILLS FOR EXTRUDER
SHAPING, AND INSERTING OF HO
WATER CURING BA
EXTRUSION OF TREADS AND SIDEWALLS AND WATER COOLING OF TREADS
BIAS CUTTING OF FABRIC FOR TIRE PLIES
PRESS "CURI
VULCANIZA
CONSTRUCTION AND FABRIC COVERING OF TIRE BEADS
BUILDING OF CUSHION AND SHOCK-BREAKER PLIES
ASSEMBLY OF TIRE . . .
"TIRE BUILDING"
MAKING OF PLIES OF BIAS-CUT RUBBER-IMPREGNATED TIRE CORD FABRIC
LABORATORIES
GENERAL OFFICES



In the Akron plant (shown here), Seiberling Rubber Company produces passenger and truck tires, automobile floor mats, inner tubes, consumer goods, and heel and sole products. The production flow chart illustrates the Seiberling "circle process" for manufacturing rubber tires, whereby the material is received at one point, manufactured through a physically circular cycle, and returned to relatively the same point for shipment

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ONE OF FRUE

AND ANOTHER

STOPPED WASHROOM LOITERING

HARRY D. FOGEL • SUPERINTENDENT, AMERICAN PAPER BOX COMPANY
MONTREAL, CANADA

We here at "American" have licked what we can only call a "nasty problem." It's a problem almost every manufacturing plant is up against, that of time wasted in washrooms. By its very nature it is usually considered hush-hush business and is seldom considered realistically.

Before moving into our new plant, which we have now occupied for about six months, we had six washrooms, equally divided among male and female employees. These washrooms were small rooms containing individually enclosed toilets and wash basins. In all we had what were considered ample facilities to take care of our 130 employees.

For years the problem had been how to keep people from using the washrooms for smoking, snacks, and lounging. Some employees would find going to the washroom provided an excuse to leave their work, or to steal a glimpse at a paper, or to talk to other employees about the ball game—or the date the night before. It was a rare occasion, indeed, when there were not three or four employees in each of the washrooms when they should have been working. There seemed to be nothing we could do, short of hiring a matron and a man to "shoo" them back to their jobs.

Time lost in loitering in washrooms was valuable production time. The superintendent, when placed in charge of designing our new building, was told to "do something about it." We went thoroughly into the subject, and the payoff is that now we have the problem licked for good.

Our present layout is a building 350x100 feet, with two 45-ft. work areas on either side of a 10-ft. center aisle. Every 100 feet along both walls we have provided two individual toilet rooms, each just large enough for one person. Each room contains one flush bowl equipped with a self-rising seat, thus eliminating urinals. Actual room dimensions are 48x34 inches. Rooms are fully enclosed to ceiling height, and properly ventilated. Along the wall outside of the rooms are two wash basins, one slop sink, and one drinking fountain.

In that section of the plant where mostly men are employed, the toilets are marked for men only. The same applies to the women's section. In the area where both men and women work, one room is used by men and the other by women. The entire layout provides twelve units, four more than in our old plant.

OVERHEAD LIGHT flashes on automatically when door of individual toilet room is bolted shut

The individual rooms have helped partially to solve our problem. But we went further than that, as can be seen in the photograph. We installed a yellow light over each doorway with a switch that is operated by the bolt in the door itself. That is, just as soon as someone closes the door and pushes the bolt home, the light automatically flashes and stays lit until the door is opened.

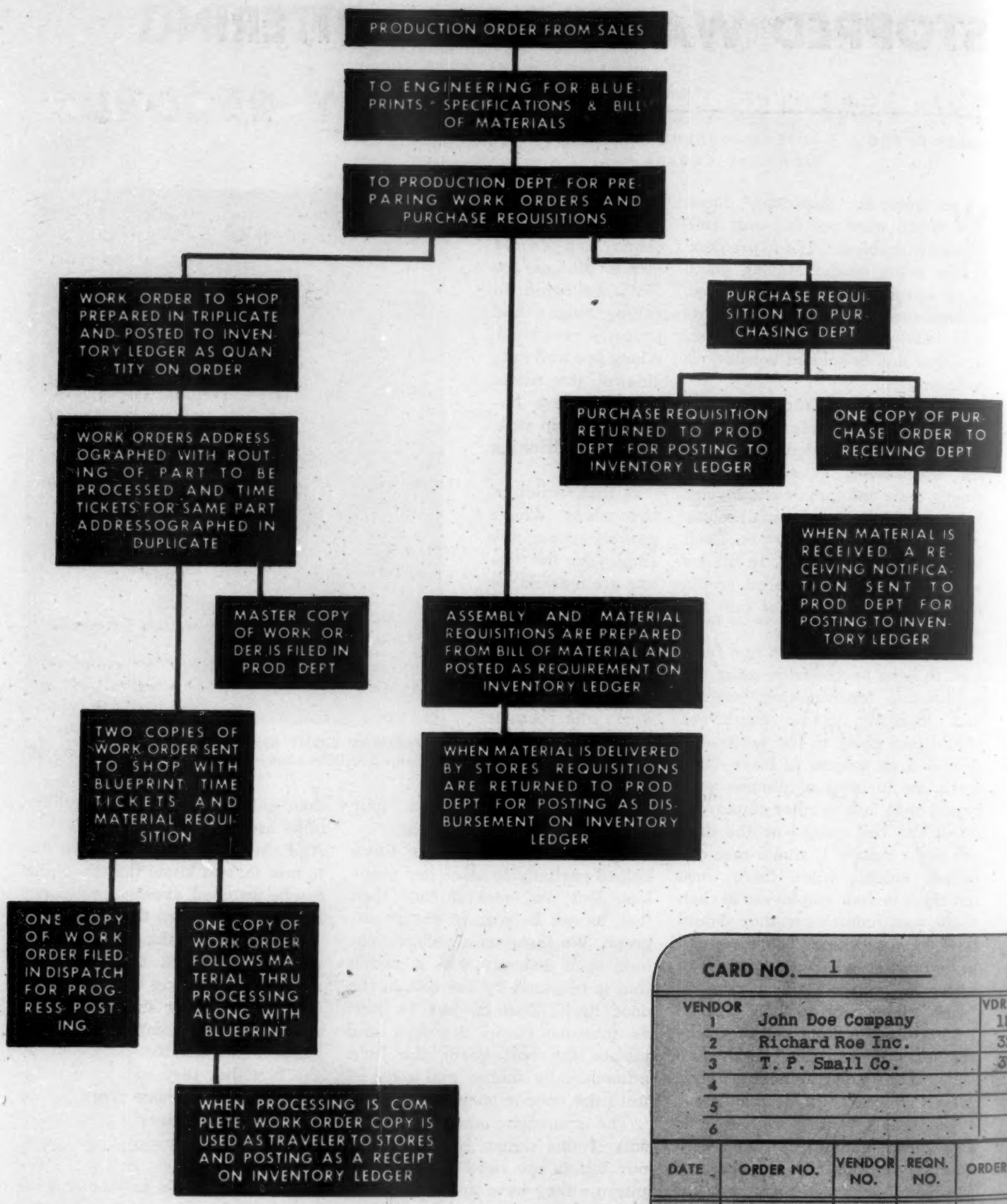
The immediate and lasting result of this design has been that our toilets are used *only* for the purpose they were intended. There are no more excuses that employees are waiting for occupancy. Every employee can see the light and knows whether or not the toilet is in use.

Because they are small, the rooms are kept cleaner. Where beforehand we could always find 15 to 20 employees in our washrooms, today we find that rarely more than one or two of the individual units are in use at any given time. And since employees have no one to talk to, and know that the lights can be watched, average occupancy has been cut more than half.

But we are not the only ones who are satisfied with the unit construction in dealing with this serious problem. For in no case has any employee complained; actually, employees seem pleased by the fact that they can have occupancy without being disturbed by the gang that formerly used washrooms to keep away from work.

* * *

(*Editor's note:* To anyone wishing to adopt this plan, it is suggested that construction details be checked with state and local departments having jurisdiction over such matters. Industrial sanitation code requirements vary. In one state, for example, separate washrooms are required for each sex, and the female washroom must be fully enclosed to ceiling height.)


PRODUCTION ORDER FROM SALES
TO ENGINEERING FOR BLUE PRINTS SPECIFICATIONS & BILL OF MATERIALS
TO PRODUCTION DEPT FOR PREPARING WORK ORDERS AND PURCHASE REQUISITIONS
WORK ORDER TO SHOP PREPARED IN TRIPLICATE AND POSTED TO INVENTORY LEDGER AS QUANTITY ON ORDER
WORK ORDERS ADDRESSOGRAPHED WITH ROUTING OF PART TO BE PROCESSED AND TIME TICKETS FOR SAME PART ADDRESSOGRAPHED IN DUPLICATE
MASTER COPY OF WORK ORDER IS FILED IN PROD DEPT
TWO COPIES OF WORK ORDER SENT TO SHOP WITH BLUEPRINT TIME TICKETS AND MATERIAL REQUISITION
ONE COPY OF WORK ORDER FILED IN DISPATCH FOR PROGRESS POSTING
ONE COPY OF WORK ORDER FOLLOWS MATERIAL THRU PROCESSING ALONG WITH BLUEPRINT
WHEN PROCESSING IS COMPLETE WORK ORDER COPY IS USED AS TRAVELER TO STORES AND POSTING AS A RECEIPT ON INVENTORY LEDGER
ASSEMBLY AND MATERIAL REQUISITIONS ARE PREPARED FROM BILL OF MATERIAL AND POSTED AS REQUIREMENT ON INVENTORY LEDGER
WHEN MATERIAL IS DELIVERED BY STORES REQUISITIONS ARE RETURNED TO PROD DEPT FOR POSTING AS DISBURSEMENT ON INVENTORY LEDGER
PURCHASE REQUISITION TO PURCHASING DEPT
PURCHASE REQUISITION RETURNED TO PROD DEPT FOR POSTING TO INVENTORY LEDGER
ONE COPY OF PURCHASE ORDER TO RECEIVING DEPT
WHEN MATERIAL IS RECEIVED A RECEIVING NOTIFICATION SENT TO PROD DEPT FOR POSTING TO INVENTORY LEDGER

FLOW CHART shows a production order's path from placement to completion. Production department prepares work orders and purchase requisitions, and maintains inventory records

STOCK RECORD ledger card is machine posted. Figures are legible and accurate. Balance available (right-hand column) is automatically tabulated by the machine

CARD NO. 1

VENDOR		VDR.NO.
1	John Doe Company	18
2	Richard Roe Inc.	32
3	T. P. Small Co.	37
4		
5		
6		

DATE	ORDER NO.	VENDOR NO.	REQN. NO.	ORDERED
JUN 4	3,313	18		500
JUN 15	3,220	18		500
JUL 13	3,120	37		300
JUL 18	3,313			
JUL 27	3,220			
AUG 6	3,120			

PRODUCTION CONTROL BASED ON IMPROVED INVENTORY RECORDS

FRED O. ORTHEY • PRODUCTION MANAGER, THE DUMORE COMPANY
RACINE, WISCONSIN

STUDY the flow chart (see facing page). It describes a simple but effective system which enables Dumore to control production better than ever with one-third of the personnel formerly used.

The system was built upon a revised and improved inventory control plan. It maintains proper inventory levels, and controls the flow of materials through processing and assembly operations. Accurate, legible, and informative records are in balance daily. One machine-posted ledger shows what materials are required, on order, and on hand. One machine operator now handles the inventory of 9000 items—a job formerly done by three clerks—despite a 20 per cent increase in volume.

THE OLD SYSTEM. Material and production control records had always been prepared by hand. An accurate inventory balance was rarely available. Material on hand was either in excess of current needs, or a shortage threatened production, merely because hand posting failed to keep the inventory ledger current. It was difficult to absorb increases in volume without hiring additional clerks. Also, time was never available to assemble all the information so necessary for close control.

THE NEW SYSTEM. To begin with, the method of numbering parts was improved. Several record forms were revamped to include only essential information. As a result, the machine posting of properly designed forms made the records easy to complete.

When a posting is made, the machine automatically compares the three inventory balances as they are printed. And a surplus or deficit balance is printed for each item of material. Records are maintained on finished stock, raw materials, straight purchase items, completed parts processed in plant, and purchased parts processed.

Following revision of inventory record-keeping methods, the control system was developed.

The production order starts the ball rolling. Work and purchase orders are prepared, checked, and issued; and a definite control is established for each. Refer to the flow chart. It shows that these orders originate in and return to the production department. One copy of the work order, with blueprints from engineering, follows the material through processing until the job is completed.

Work Order Records Progress

As operations are performed on material, they are checked off on the work order. Anyone looking at the work order can see what work has been done and what remains to be done.

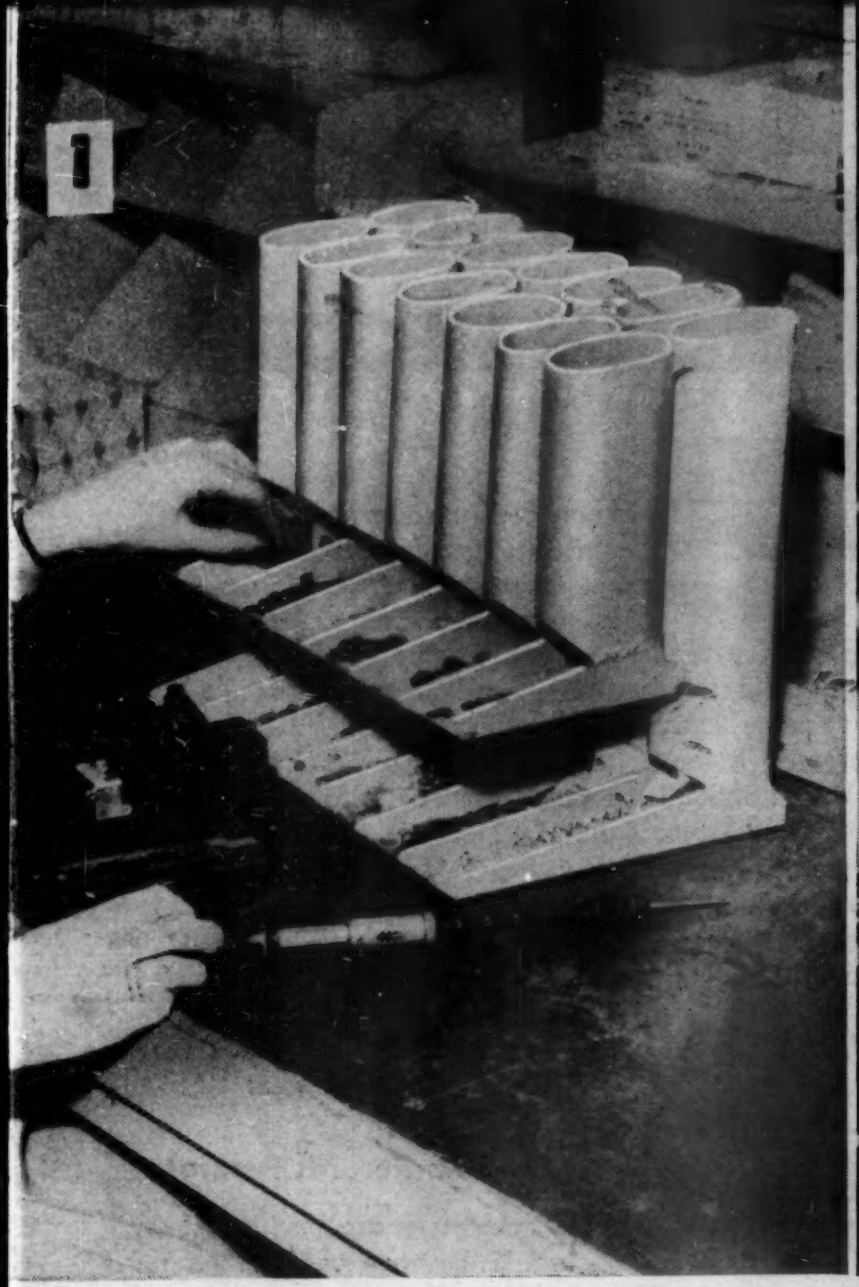
When a job is completed, the production department's copy of the work order is attached to the bill of material, and the two are filed as a permanent record.

STOCK RECORD PART NO. R-4093-210

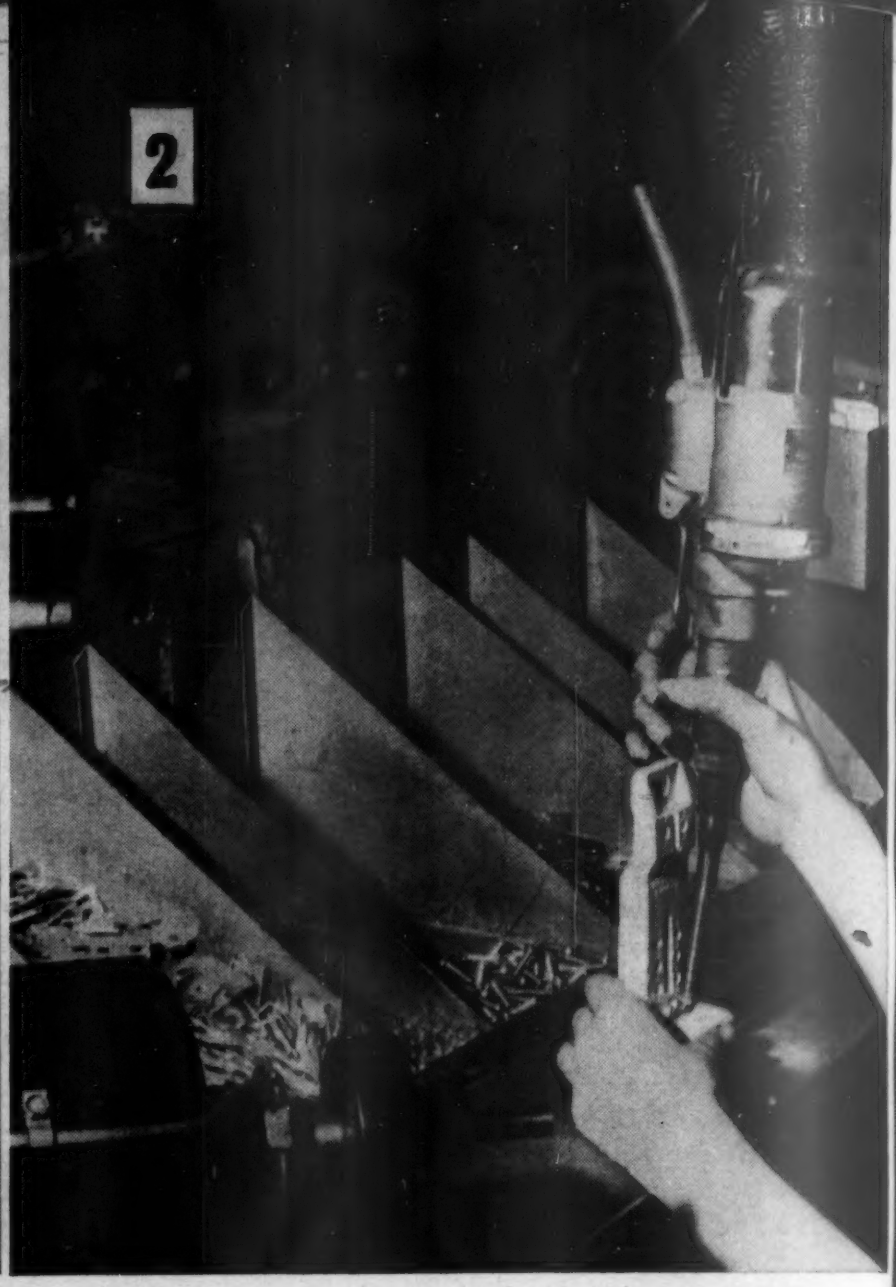
MATERIAL	DESCRIPTION
	GRINDER 115V

OPERATION IN DEPT.							UNIT	MATERIAL PER C	LOCATION	CODE	MINIMUM / ORDER QUANTITY	INSPECTION
3	4B	4E	4A	4F	7	10						

RECEIVED	BALANCE ON ORDER	DISBURSED		BALANCE ON HAND	DATE	RESERVED		BALANCE AVAILABLE
		DEPT. ORDER NO.	QUANTITY			DEPT. ORDER NO.	QUANTITY	
	500							
	1,000				JUL 18	32,210	500	
	1,300				JUL 18	32,103	500	
					JUL 18	6 .88	300	1,300CR
500	800			500	JUL 18			800CR
300	500			800	JUL 27			500CR
300	200			1,100	AUG 6			200CR



1



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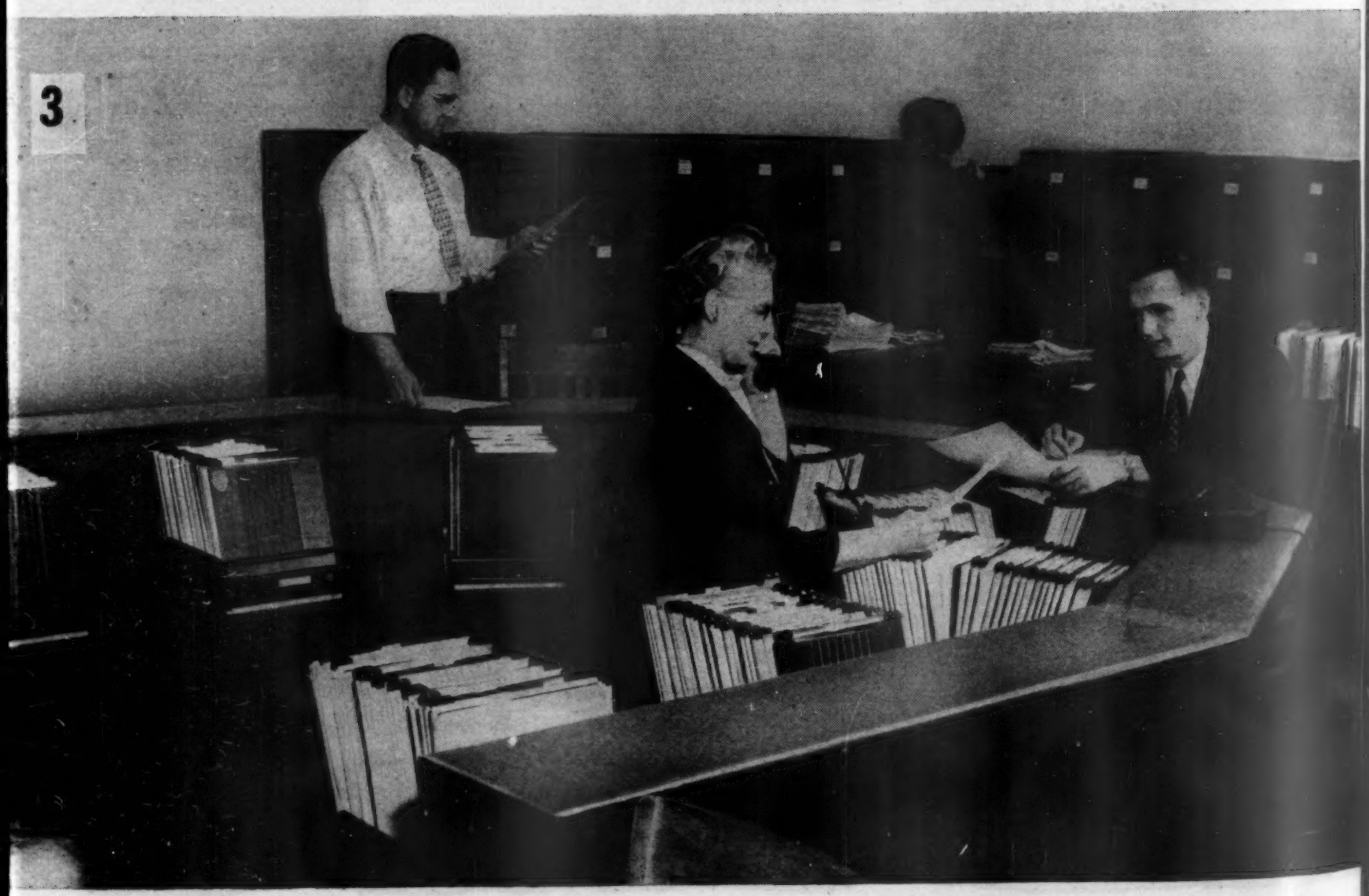


3

MAKING JOB IMPROVEMENT EVERYBODY'S JOB

R. C. HASSELHORN • PRESIDENT, COOK ELECTRIC COMPANY
CHICAGO

EVERYONE at Cook Electric Company has job improvement on his mind. Everyone is a member of the work simplification team. That means workers, supervisors, engineers, and top management. And it has paid off handsomely.

Ours is a small company. There is no staff methods organization. Instead we have tried to make employees see that it is their responsibility—and to their benefit—to perform their duties in the most efficient manner possible. Top management, you might say, simply calls the signals—and the play is on for simplified work, improved quality, and reduced costs.

Success of the program may be attributed to two basic factors:

A. *Cultivation of the right approach to job improvement.* A wholesome curiosity and a constant questioning attitude are encouraged. We emphasize the thought that no operation is perfect, that every operation can be improved, and that the improvement process is a continuing one that never stops. It's customary in our plant to look at present methods with a jaundiced eye. Just because "we've always done it that way" doesn't mean a thing. Everyone in the organization is ready at any time to consider any idea that may lead to the improvement of an operation.

B. *Acceptance by all employees of a few of the principles of work simplification.* (1) No operation is perfect; (2) improvements don't just happen; (3) small ideas turn out to be big ones; (4) every idea should be gone over with a fine-tooth comb before rejecting it; (5) watch for the value of each motion or group of motions; (6) eliminate useless or fatiguing motions; (7) use all materials and equipment to best advantage before advocating changes; (8) use simple devices and gadgets in place of complicated mechanisms; (9) be sold on an idea yourself before you try to sell it to others; (10) balance reduction in cost against the cost of making the change.

The rules, as you can see, are informal. So is the program. Perhaps what makes it work so well is the feeling throughout the organization that change is a perfectly natural thing—and that if changes aren't being made, something must be wrong somewhere.

Also we have conscientiously tried to make every one of our employees feel that he or she "belongs." We tell them all we can about production policies, about sales plans, about our relations with our customers. It's the simplest way we know of getting them to play on the team.

Typical improvements made at Cook Electric through the development of the right attitude toward the job and through the application of work simplification principles are shown in the photographs.

1 ***Radio relay assembly.*** Parts used to be contained in boxes. There were boxes all over the place. Now, instead, a shipshape hopper from which the operator gets parts with a simple sliding motion. Inexpensive jig holds assembly. Operator has now got rhythm. Never has to reach beyond normal work area. (She paused here so her hand would not obscure work and workplace while photographer shot the picture.) Result: production increased 25 per cent.

2 ***Assembly of telephone lightning arrester.*** Operator has the right tools to work with. Prepositioned electric driver in place of spin-tight wrench. Motor-driven nut spinner mounted on bench. All parts located within normal work area. Results: production increased from 300 to more than 1200 assemblies per day; work is less fatiguing.

3 ***Work simplification in the office.*** It works there the same as it does in the shop. Horseshoe workplace and counter put inventory control records within convenient reach of clerk inside enclosure. And the records are swivel-mounted so that they can be consulted from the other side of the counter by production men, stock men, or anybody else who is interested. Results: clerical time saved; less space required; telephone transmittal of information from office to shop speeded up.

4 ***Hydraulic lift from one floor level to another.*** A simple installation, but what a difference it made. Formerly, loaded floor trucks had to be pushed up a steep ramp. Often took two men. Now the handler merely pulls a lever; the hydraulic lift does the rest. A similar lift has been installed at the main receiving dock. Result: three men transferred to other jobs.

HOW TO SELECT AND MAINTAIN

ROBERT B. TAYLOR • CONTROL ENGINEERING DIVISION, GENERAL ELECTRIC COMPANY, SCHENECTADY

DEFINITE-TIME control relays make it possible to time automatically and accurately any function or process that may be performed electrically. Table 1 (page 104) shows the wide range of jobs from which the human error inherent in manual operation has been successfully eliminated by utilizing such relays in conjunction with suitable control.

On a 50-ton crane, for example, the definite-time relays shown in one of the illustrations provide fast, uniform acceleration of the crane motors, independently of the speed with which the operator manipulates the master switches in the cab. With the manual drum controllers formerly used, operation was much less uniform and the maintenance expense higher on both control and motors.

Accurate control of the curing time in the compression molding of plastics is essential. At the twist of a knob of a definite-time relay, the press can be made to open after the exact curing time required has elapsed.

Almost any desired timing, from a small fraction of a second up to several hours, may readily be secured with the various types of time-delay relays now available. For most uses relays of the so-called "interval-type" are suitable. Timing is initiated by the opening or closing of a switch or circuit. At the end of the time interval, the relay contacts are actuated and either remain in the "timed-out" position or are reset automatically, depending on the type of relay and the circuit. As a rule re-setting occurs in a fraction of a second.

Also available are timers of the "repeating cycle" variety. These have one or more contacts that close for a definite period and open for another time period. This cycle is repeated as long as desired.

In selecting, installing, or maintaining control involving definite-time relays, a knowledge of the basic principles of operation of the different types is of advantage.

Magnetic flux decay. This type of relay (Figure 1) has a heavy magnetic circuit of soft iron. When the coil is energized by a d.c. (or rectified a.c.) voltage, the armature closes instantly. Time delay occurs on the drop-out. One variety of coil has a copper sleeve surrounding the core, which results in a slow decay of magnetic flux when the coil is de-energized. Other relays have a plain coil so connected in the control circuit that it may be short-circuited to initiate the time-delay drop-out.

As many as three or four contacts for control circuits may be provided, with a choice of two frame sizes capable of adjustment from ¼ to 2 seconds, and from 2 to 6½ seconds, respectively. The same principle of operation is utilized in a relay with a power contact capable of shorting out, after a time delay, the starting resistor for a d.c. motor.

The timing of most varieties of flux-decay relays may be adjusted by changing the armature spring pressure, or by changing the thickness of a non-magnetic armature shim if a greater change of timing is desired. Because the iron of the magnetic circuit is saturated, the timing is independent of ordinary variations in line voltage.

The flux-decay relay (or "magnetic time" relay) is the simplest and most rugged of the many types of time-delay relays. Its mechanical life is long, and any parts that may eventually wear out are readily replaced.

Motor-driven. If a miniature motor with substantially constant speed is coupled to a contact-operating mechanism through an electromagnetically operated clutch and a suitable gear reduction, the time delay secured will depend on the travel necessary to trip the relay, and the gear ratio.

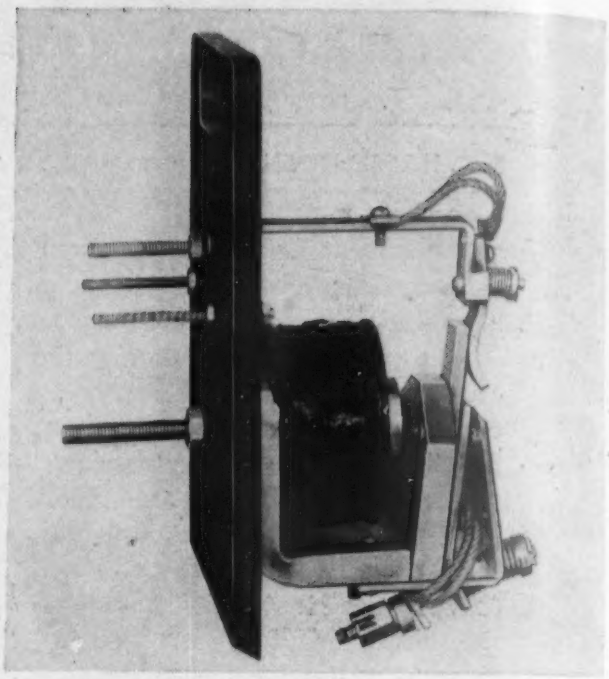


FIGURE 1. This is a magnetic flux-decay relay with 80-amp. contacts. Note the heavy magnetic circuit

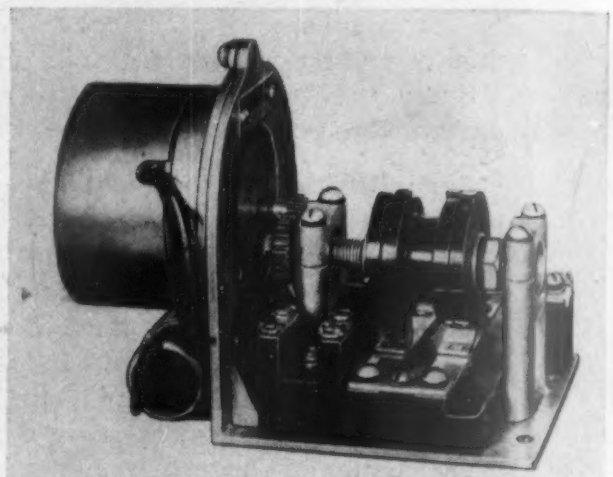


FIGURE 2. Here is a time-delay relay of the repeating cycle type, driven by an alternating current motor

Relays are available with a time adjustment range measured in seconds. Almost identical relays, with a different gear ratio, permit timing up to several hours. The electro-magnetically operated clutch makes possible instantaneous resetting of the relay mechanism.

With a.c. power supply, the driving motor is nearly always of the synchronous type; hence timing independent of normal line voltage variations varies with frequency.

Although d.c. motor-driven definite-time relays are available, the demand for them is relatively

DEFINITE-TIME-CONTROL RELAYS

FIGURE 3. Electronic timer, shown with cover removed, depends on the discharge of a condenser for the time delay

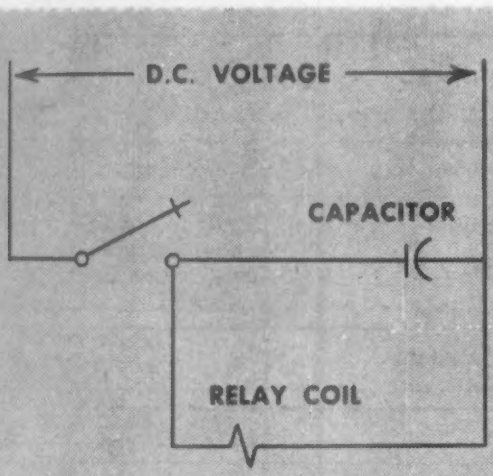
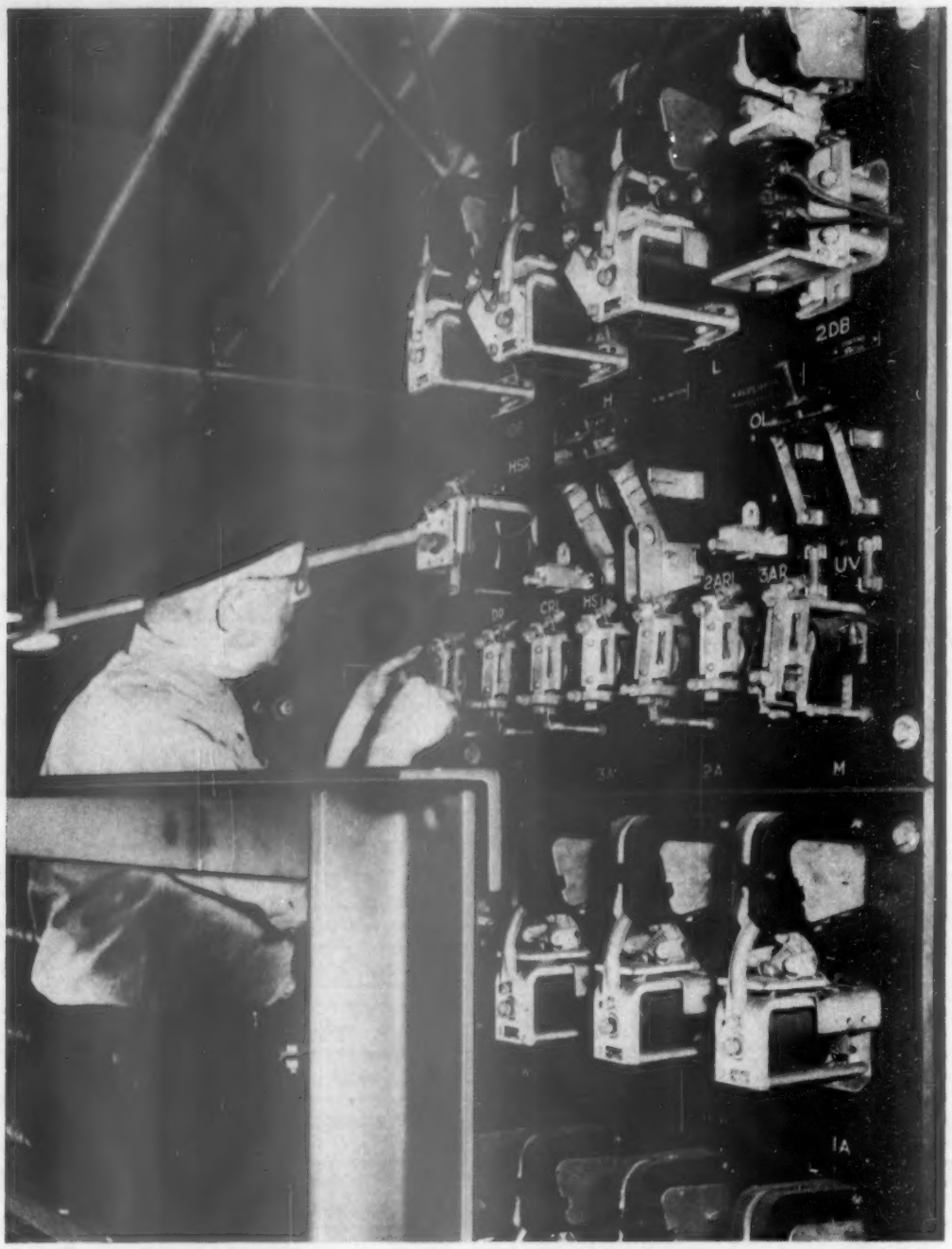


FIGURE 4. This elementary circuit diagram illustrates the operation of capacitor-discharge timing devices



INSPECTING the magnetic flux-decay type definite-time relays on the hoist control of a 50-ton crane. These relays accelerate the motors uniformly, regardless of how fast the operator manipulates the switches

small, and the price comparatively high. The timing will vary inversely as the line voltage (a lower voltage results in a longer time delay).

With the majority of motor-driven relays, timing is adjusted by changing the travel necessary to actuate the contact mechanism. For process applications where the time setting may be changed often, a relay with external time-setting knob is to be preferred. For such applications as a.c. reduced-voltage motor starters, however, it is preferable to have internal time setting to discourage tampering.

Motor-driven time relays commonly are equipped with single-pole, double-throw or single-pole, single-throw time-delay contacts, with an additional normally-open instantaneous contact available for momentary contact control.

Because of their construction, motor-driven timing relays of the interval variety are subject to mechanical wear. For this reason they are not, in general, suitable for extremely frequent operation. It is suggested that applications involving moderately frequent operation be referred to the relay manufacturer. The ease with which worn parts may be replaced varies considerably according to the design details of a particular device.

Motor-driven relays of the repeating-cycle type (Figure 2) are usually of simple construction with cam-operated contacts that open and close in a cycle that continues as long as the motor is energized. The time of one complete cycle (ON plus OFF) usually is fixed by the motor speed or gear ratio, but the "percentage on" of the cycle may be readily adjusted. These relays are designed to provide satisfactory life when operated continuously.

Mechanical escapement. This type of relay uses an escapement mech-

TABLE 1

Suggested Types of Definite-Time Relays, for Specific Applications

APPLICATION	CONTROL POWER AND DUTY	TYPICAL DEFINITE-TIME RELAY TYPE
Battery charging	A.C.	Motor-driven (special with manual reset)
Cleaning baths, dip tanks	A.C.	Motor-driven[1]
Crane control	A.C., frequent operation D.C., frequent operation	Flux decay with dry disk rectifier Flux decay
Elevators	A.C., non-interfer. relay D.C., non-interfer. relay M.G., set shutdown	Flux decay with dry disk rectifier Flux decay Electronic
Electronic control	A.C., timing preheating of cathodes	Motor-driven (special with non-adjustable timing)
Gas-engine-driven arc welders	D.C., automatic slowdown	Flux decay
Grinders, automatic	A.C.	Electronic
High-frequency heating and hardening	A.C.	Motor-driven[1] or electronic
Hydraulic presses	A.C.	Electronic
Machine tools	A.C., moderate duty A.C., frequent operation D.C., moderate duty D.C., frequent operation	Flux decay with rectifier, motor driven, or electronic Flux decay with rectifier, or electronic Escapement or flux decay Flux decay or capacitor discharge
Milling machines	See "Motor Starters, Reduced Voltage"	
Mixing machines	A.C.	Motor-driven[1] or electronic
Molding presses	A.C.	Motor-driven[1] or electronic
Motor starters, reduced voltage	A.C., general purpose A.C., severe duty D.C., general purpose D.C., severe duty	Motor-driven Flux decay with dry disk rectifier Escapement or flux decay Flux decay
Printing presses	A.C., time acceleration to preset speed	Escapement or flux decay with rectifier
Process timing	A.C. D.C.	Motor-driven[1] or electronic Motor-driven[1] or electronic
Rubber mill drives	A.C., motor starting D.C., motor starting D.C., field economy	Motor-driven or flux decay with rectifier Flux decay Flux decay
Sequence starting of several motors	A.C.	Motor-driven or flux decay with dry disk rectifier
Steel mill auxiliaries	D.C., frequent operation Bad dust conditions	Flux decay
Sugar centrifugals	A.C., process sequence D.C., motor starting	Motor-driven[1] or electronic
Textile drives	A.C. D.C.	Flux decay with rectifier Flux decay
Time-delay undervoltage	A.C.	Flux decay with rectifier
Tool-lifter solenoids	D.C., to insert resistance after time delay	Flux decay
Valves, motor operated	A.C., intermittent contact relay to prevent overshooting on regulating duty	Motor-driven (repeating-cycle type)
Valve sequence operation	A.C.	Motor-driven (special)

[1]Type with external time-setting knob preferred.

TABLE 2

GENERAL TYPE	
FEATURES	INTERVAL-TYPE (NON-REPEAT) ADJUSTABLE
Power supply	25, 50, or 60 cycles, a.c.
Maximum voltage	230
Range: Forms available provide timing From To	 0—10 seconds 0—8 hours
Adjustment range of each form (per cent of maximum time)	0—100%
Repeating operation (close contact, reset, and start new interval automatically)	With one timer (requires additional contact at zero—optional)
Time to reset	1 second
A.C. contact rating {115 volts {230 volts	1 amp. 1 amp.
Circuit arrangement	S.P.—S.T.
Method of setting timing	Optional—either external or internal setting can be locked
"Stepless" adjustment	Yes
Scale marking	Time units
Possible timing error due to voltage fluctuation	None
Visual indication of elapsed time	Yes

anism which is essentially similar to that used in clocks, modified to be self-starting. It is operated by an electromagnet, which stores energy in a spring that actuates the escapement through a rack and pinion to provide the delayed action of the contacts.

Timing is adjusted by changing either the length of the pendulum or the distance through which it is moved. The range of adjustment

Principal Characteristics of Typical Definite-Time Relays

MOTOR-DRIVEN		ELECTRONIC	MAGNETIC FLUX-DECAY	
INTERVAL-TYPE (NON-REPEAT) ADJUSTABLE	REPEATING ON AND OFF. FIXED TIME CYCLE	INTERVAL-TYPE (NON-REPEAT) ADJUSTABLE	INTERVAL-TYPE, INSTANTANEOUS PICKUP, TIME-DELAY DROP OUT	INTERVAL-TYPE, INSTANTANEOUS PICKUP, TIME-DELAY DROP OUT
25, 50 or 60 cycles, a.c.	25, 50 or 60 cycles, a.c.	25 or 50/60 cycles, a.c.	D.c. (also a.c. with rectifier)	D.c. (also a.c. with rectifier)
600	230	230	600	600
4 seconds 2 hours	10 seconds (total cycle) 1 hour (total cycle)	0.045 seconds 120 seconds	0.25 seconds 2 seconds	2 seconds 6.5 seconds
10—100% Approx.	1–99%[1]	5—100%	50—100% Approx.	50—100% Approx.
Requires two timers—time independently adjustable	Repeats ON and OFF time continuously	Requires two timers—time independently adjustable	Requires two timers—time independently adjustable	Requires two timers—time independently adjustable
Instantaneous	Continuous operation	Varies from 0.116 sec. to 1 sec. in different forms	Instantaneous	Instantaneous
15 amp. 15 amp.	10 amp. 10 amp.	1 amp. (10 amp.)[2] 0.5 amp. (5 amp.)[2]	5 amp. 5 amp.	10 amp. 10 amp.
S.P.—D.T.	S.P.—D.T.	S.P.—D.T.	Up to 3 circuits	Up to 4 circuits
Internal	Internal	External	Spring-tension adjustment	Spring-tension adjustment
Steps approx. 5% max. time	Yes	Yes	Yes	Yes
Time units	Per cent	Per cent	None	None
None	None	Voltage drop increases time slightly and vice versa	None	None
No	No	No	No	No

[1] ON time adjustable from 1 to 50 per cent of total cycle. ON time from 50 to 99 per cent obtained by simple change of connections. Per cent time OFF is difference between ON time and total cycle.
[2] Special form.

is ½ to 4 seconds. The single contact is either normally open or normally closed.

When a number of contacts are required, escapement-type relays may be furnished with as many as six contacts operating in time sequence, and independently adjustable from 1 to 10 seconds. These relays are available for operation on either a.c. or d.c. circuit, as may be required.

Electronic. Operation of most electronic timers (Figure 3) depends on the fact that a charged capacitor will discharge slowly through a shunting high resistance. Timing is initiated by closing a switch or contact. When the charge of the capacitor has been reduced to a predetermined value, the electronic tube passes sufficient current to pick up the relay.

Timing may be adjusted over a 20-to-1 range for the timer illustrated by means of a small potentiometer that changes the voltage to which the capacitor is charged. The shortest time that can be secured is about 0.045 seconds, the longest about 120 seconds. Contacts are single-pole, double throw. The timing varies slightly with changes in line voltage.

Since the timing does not depend on moving parts, except in

the telephone-type relay, the electronic timer is well suited for frequent operation. It is also hard to beat for extremely short time intervals not readily secured with any other means. The repeat accuracy is excellent.

The small potentiometer for adjusting the time setting may be separately mounted and wired to the relay. Such a remote control arrangement is convenient for certain applications and is not so readily obtained with mechanical timers.

Fluid flow. One of the oldest means of securing delayed action is the oil dashpot. It is essentially a device with close-fitting parts that are readily affected by dirt, gumming of the oil, or corrosion. In addition, timing is subject to variation with temperature due to changes in viscosity of the oil.

The air dashpot is also affected by dirt, corrosion, and other factors, unless designed to eliminate close-fitting parts. More satisfactory are time relays of the pneumatic type, designed to exclude dirt from the interior, and particularly from the small orifice for the air. Such devices may use a diaphragm or bellows to force the air through an orifice, with a time delay from less than 1 second up to about 15 seconds, or longer.

Thermal. Heat generated by the passage of an electric current through high-resistance wire may be utilized to cause direct expansion of a "hot wire," or produce deflection of a bimetallic element. Although quite simple and generally inexpensive, thermal relays have not enjoyed wide usage in industry because of several inherent disadvantages.

Inertia. It is well known that a mass accelerated by a certain force requires a definite time to acquire a given velocity or to travel a given distance. Some time-delay relays utilize this inertia principle, usually in the form of a small flywheel. The time range is limited, varying from less than a second up to several seconds.

Capacitor Discharge. Instead of controlling an electronic tube, as in electronic timers, the discharge of a capacitor may control directly the drop-out of a relay. If the switch in Figure 4 is closed, the relay picks up and the capacitor is charged to line voltage. When the switch is subsequently opened, however, the drop-out of the relay is delayed until the capacitor has discharged to the drop-out voltage.

There are many variations of the basic circuit, including some with rectifiers for a.c. operation. The capacitors required are many times larger than for electronic timing. When a high degree of accuracy in timing is not required, the capacitors may be the electrolytic type.

Relays of the flux-decay type, but without a copper sleeve around the core, are well suited for capacitor-discharge timing because the drop-out voltage is quite low.

Capacitor-discharge relays usually have been incorporated in complete controls, and have not yet been marketed as self-contained timing devices for general application. Timing from 1 to 15 or 20 seconds is readily obtained.

The principal characteristics of a number of typical definite-time relays are shown in Table 2.

INSTALLATION AND MAINTENANCE

When installing time relays, preserve all diagrams or instructions furnished by the manufacturer. Study them carefully before attempting to operate the device, or to adjust the time delay. Remove any temporary fastenings used to prevent damage in shipment. For relays of the oil-dashpot type, see that the dashpot is clean, and fill it with the proper grade of oil.

Maintenance of time-delay relays should conform to the well-established fundamental maintenance principle of heading off trouble before it occurs, by means of periodic inspection. It is suggested that inspection include the following points:

1. Check the timing. A gradual change may indicate wear that should be investigated. In most instances a check with a stop watch will be sufficiently accurate.

2. Carefully inspect moving parts for wear.

3. See that the relay is kept reasonably clean.

4. Check contacts for wear. See that contact pressure is adequate and has not been reduced by wear or inadequate spring pressure.

5. Do not file contacts. Do not use abrasive cloth or other cutting material on them, because sharp insulating particles may become imbedded in the surface and prevent making contact. Properly designed contacts will become darkened and rough, but this should not interfere with operation.

6. Avoid lubrication unless recommended by the manufacturer.

7. Air or oil dashpots have close-fitting parts affected by dirt, corrosion, and gumming of the oil. Clean them frequently if located in dirty places. Replace dashpot oil before it gets gummy.

8. With electronic timers, test the tubes at regular intervals. Keep spare tubes on hand.

9. Keep on hand spare contacts, springs, coils, and any other parts likely to require replacement.

10. Watch for excess heating of parts, evidenced by discoloration of metal parts, charred insulation, or odor.

When shooting trouble first make certain that the trouble is actually in the relay, regardless of the type. If possible, actuate by hand the contact or switch that initiates the timing and determine that voltage is actually being applied to the relay itself.

If electronic timers fail to operate satisfactorily, check the tube and carefully inspect and operate the relay by hand to make sure there is no mechanical binding due to dirt or corrosion. If these steps fail to locate the fault, a person experienced in the maintenance of electronic control should systematically check all the various components. If such an experienced person is not available, it is recommended that the complete device be returned to the manufacturer for repair.

A LITTLE MORE PAPERWORK—BUT IT HELPS CUT REPAIR COSTS

RAY STROPPEL • PLANT ENGINEER, TOOL STEEL GEAR & PINION COMPANY, CINCINNATI

Two special features of our maintenance work-order system are adding greatly to our plant maintenance efficiency.

1. On each work order there is a space for the mechanic to answer the printed suggestion: "Your Idea Will Help Prevent Trouble—Write It Here."

2. An extra form (illustrated) is used to report completion of work to the production head who requested it.

Basis for the good results obtained by these features is the simple maintenance work-order system itself. To realize how and why, it's necessary to show briefly the operation of this system. Subject to the customary approvals of management for work costing over a certain amount (here it's $50), production department heads request all repairs or improvements in writing. The form used is a typical one, with spaces for dates, location, and nature of work. It goes to the maintenance clerk, who prepares a work order in triplicate.

The original copy is placed on a control board in the maintenance office, which has a hook for each maintenance worker. Thus the board shows at all times both the total and individual work load. If more than one trade is involved in any work, the order is passed on to different hooks as each trade completes its work.

The duplicate copy of the work order is given to the trade foreman so that he will always have a complete record of the work load of his men.

The triplicate goes to the workman. When the job is finished he rings out his time, jots down on his copy any ideas for preventing a recurrence of the trouble causing the repair, and returns it to the clerk. It is then checked by the clerk for all entries as to time, material, etc., and finally for preventive maintenance ideas. These ideas are relayed to the plant engineer for consideration and action. As a result, the frequency of repairs has been considerably reduced. Measured by this fact alone, the system has justified the expense and effort, and proved worthwhile.

To close out a completed work order, the clerk removes the original copy from the control board and retrieves the foreman's copy. As a final step he prepares in duplicate a "Report of Work Completed" form. One copy is permanently filed in the maintenance office, and all copies of the work order are destroyed.

The other copy of the "work completed" report goes to the interested department head. Prior to this routine, awareness of completion of work by department heads was hazy. While the completion of major or emergency items usually was self-evident, that of small jobs was rather uncertain. Department heads had to resort to frequent physical checking to ascertain the status of active requests.

One way of answering this problem would have been for the workman to report completion of the job each time to the department head, and possibly get his approval signature on each order. But this method has some serious disadvantages, principally loss of valuable time by skilled workers.

In the present plan, the maintenance clerk makes the rounds of 26 department heads four times a day to deliver completion reports. This also gives him an opportunity to pick up requests, discuss obscure requests for needed details, and keep these men informed of developments or delays.

Of most value, however, is the fact that busy department heads need not leave their office to check the status of their requests. By matching the completion reports against these requests, they now are able to check off the completed jobs without uncertainty and loss of time.

REPORT OF WORK COMPLETED

DATE STARTED 5/14/47 JOB NO 4663 DEPT. 567

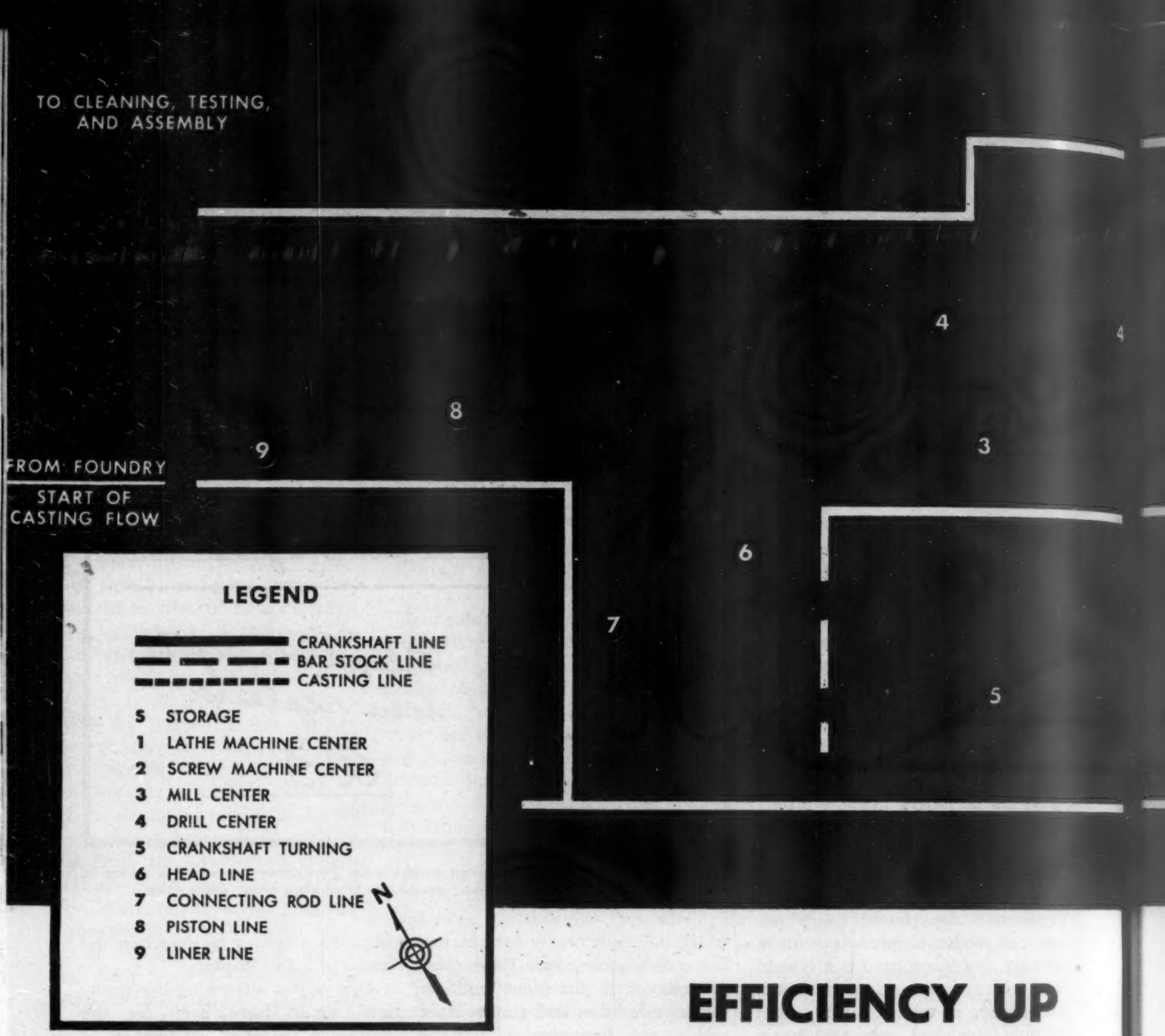
DATE FINISHED 5/14/47 REPORT TO MR. J. Schnorbus

Flood lamps has been replaced

R.S.

SIGNED

COMPLETION REPORT supplements a work order (not shown because it is similar to work orders in general use), tells busy production head when repair job is done



EFFICIENCY UP

W. F. TIEMANN • WORKS MANAGER, SUPERIOR ENGINE DIVISION, NATIONAL SUPPLY COMPANY, SPRINGFIELD, OHIO

TWICE the number of heavy duty diesel and gas engines produced in the same space. That is the goal of the $1,500,000 improvement and modernization program at the Superior Engine Division of the National Supply Company.

An immediate advantage was the increase of 24 per cent in over-all efficiency of operations during the first year of the program.

FIRST DECISION. For many years Superior had manufactured three lines of engines. It was decided to concentrate on manufacturing heavy duty slow speed diesels, together with a new 300 HP gas engine for oil field drilling, and to dispose of the other lines. The production goal was set on the basis of sales potential, and Superior turned to the problem of converting the plant.

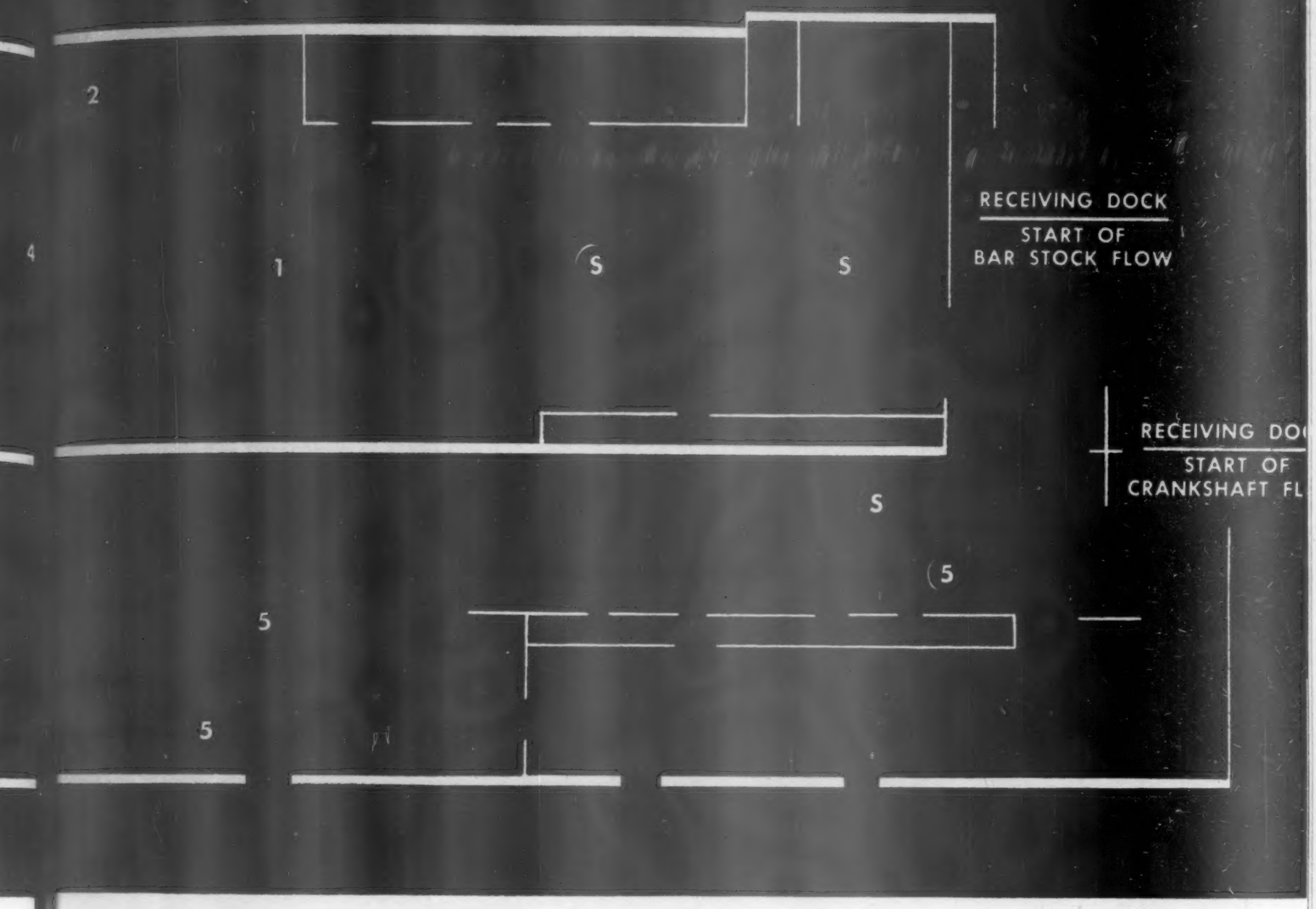
This decision to concentrate set off a train of problems, the solution of which required months of careful, painstaking analysis and planning. Two basic questions:

1. What new equipment would be required?

2. What layout would lend itself to the most efficient manufacture of parts and assembly of finished product?

EQUIPMENT DECISION. New equipment was the easier of the two problems. After the engineering department had frozen the designs, careful analyses were made to find the proper sequence of machining operations and the machining times for each part. The required number of each type of production equipment was then determined on the basis of the times developed.

With this known, a survey of the equipment on hand was made. Much of it was found to be equal to the new requirements, some could be adapted, and some must be replaced. Purchase orders were immediately placed for the necessary new machines and work started toward finding an answer to the second question.



24 PER CENT WITH NEW LAYOUT

LAYOUT DECISION. The first step was to make, to scale, small layouts showing the floor plan of the plant. On these layouts the flow of each product was traced as it had formerly been produced. The results of these "distance-traveled" studies—as well as the machining times for each operation—were compiled on a process flow chart. The proposed new sequence of operations and new machining times were also shown.

With this chart as a guide, a large-scale layout was made and cut-out templates spotted, with straight-line flow always the prime consideration. Generous working and parts storage areas were allocated to each machine, planned to eliminate unnecessary handling, to facilitate material storage, and to promote good housekeeping by providing places for all necessary items, with no waste space for miscellaneous and obsolete material to accumulate.

MACHINING DECISION. Because of the diversity of operations involved, it was found advisable to classify the fabrication of parts into two types:

1. Those suitable to progressive machining and assembly.

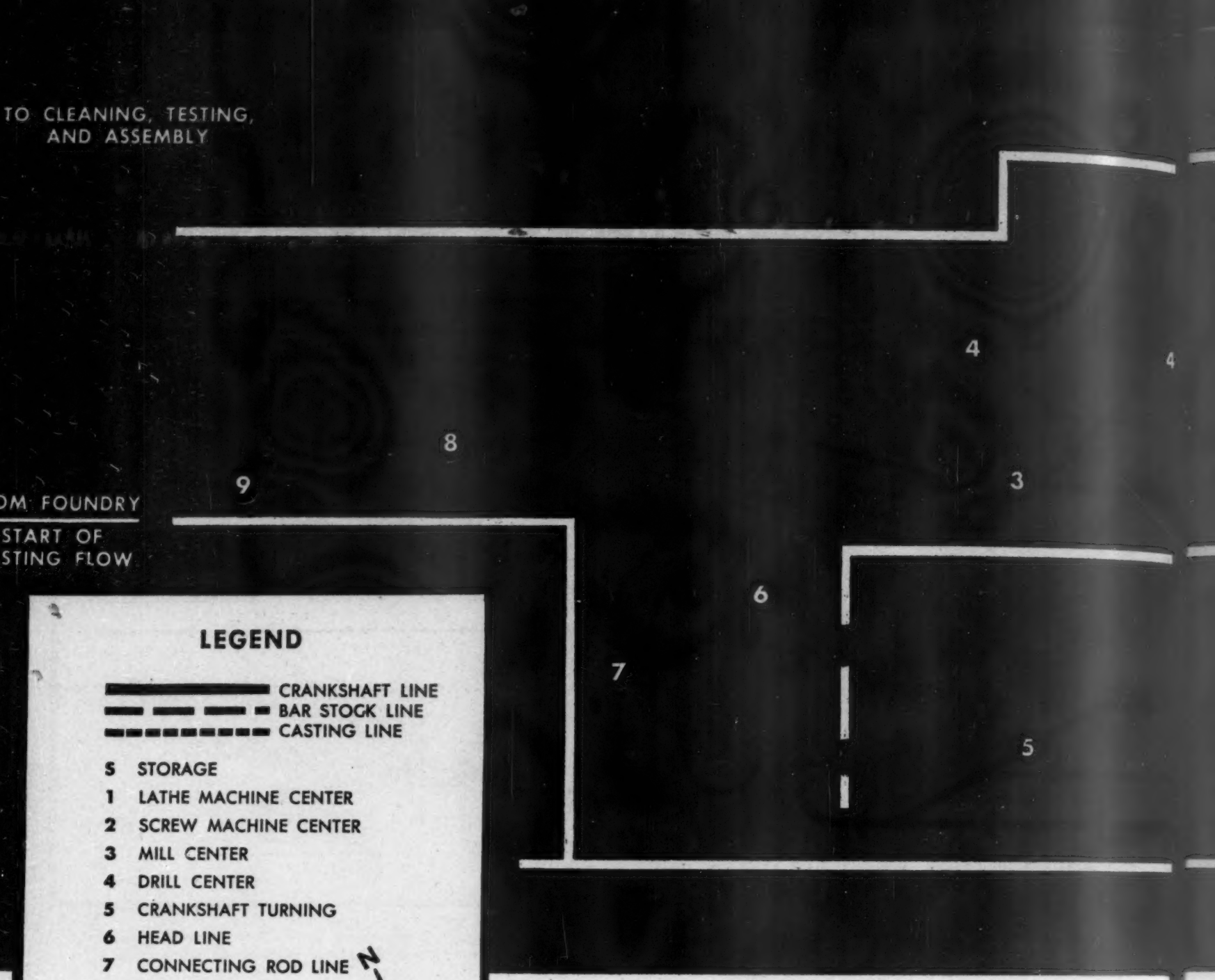
2. Those which could best be worked in machine and assembly centers.

In both cases, processing machinery and machine centers have been arranged in such a manner that the sequence of machining parts is in a progressively westward direction, without back-tracking and with a minimum number of cross-overs in the plan.

The receiving point for crankshaft forgings is located at the east end of the plant. The dock is provided with crane facilities and an overhead extension to simplify unloading from trucks.

Machine tools required for the various operations on the crankshaft are arranged in machining sequence extending westward from the receiving dock.

Bar stock is received at a separate unloading dock at the east end of the plant, classified by size and material specifications, and stored on racks. This stock is machined into small parts, such as camshafts, push rods, pump shafts, etc., in a section containing four separate



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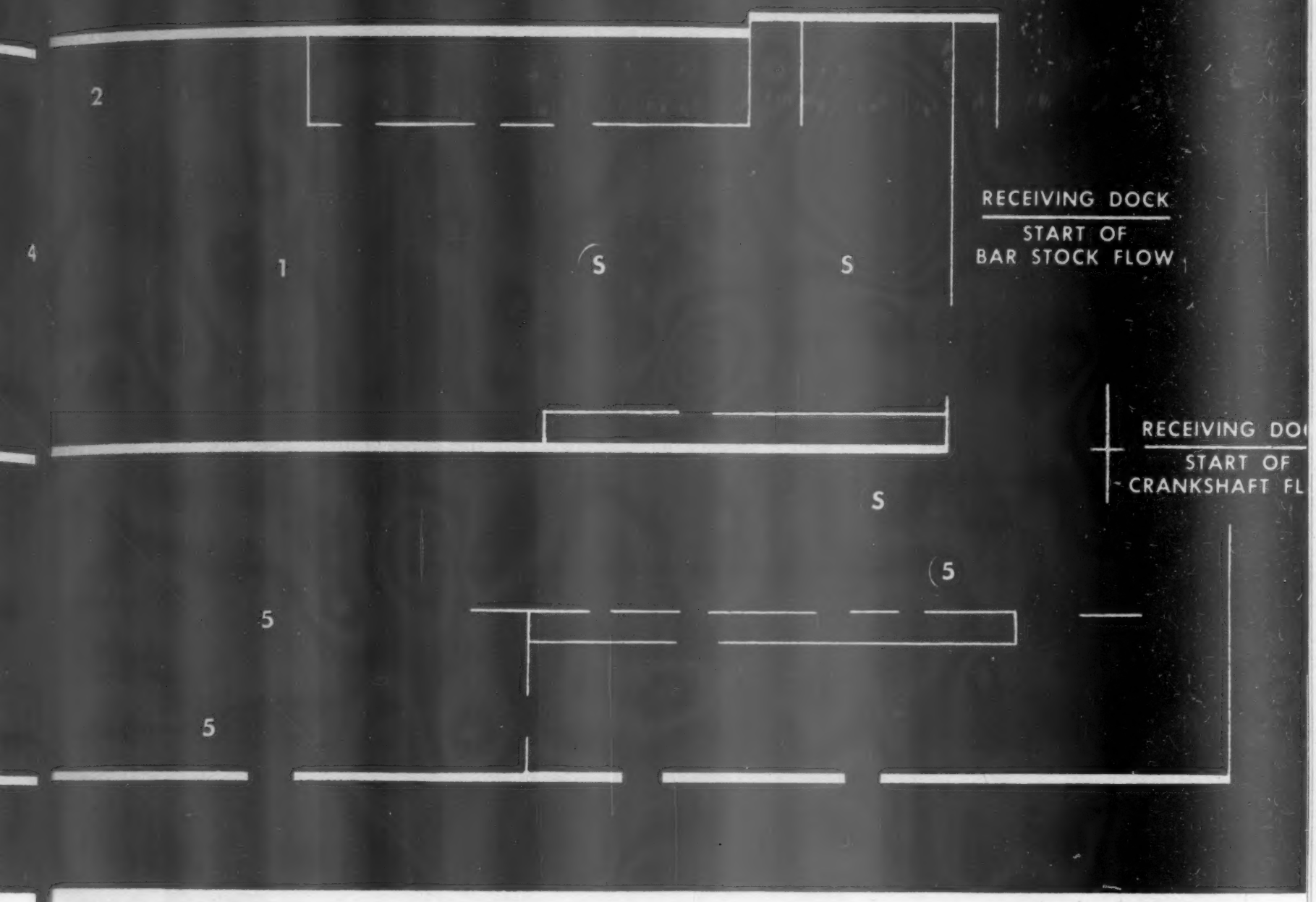

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machine centers composed of turret and engine lathes, screw machines, milling machines, and drill presses. The parts processed in this area are of such a nature that the number of units in each lot run and the repetitiveness of operations do not warrant the establishment of progressive lines.

Three types of castings—cylinder heads, pistons, and liners—and connecting rod forgings were found to lend themselves to the establishment of progressive machining centers. Since the finishing operations on connecting rods and cylinder heads require similar equipment, these two lines were set up in adjacent positions to permit use of the finishing machines on both types of parts.

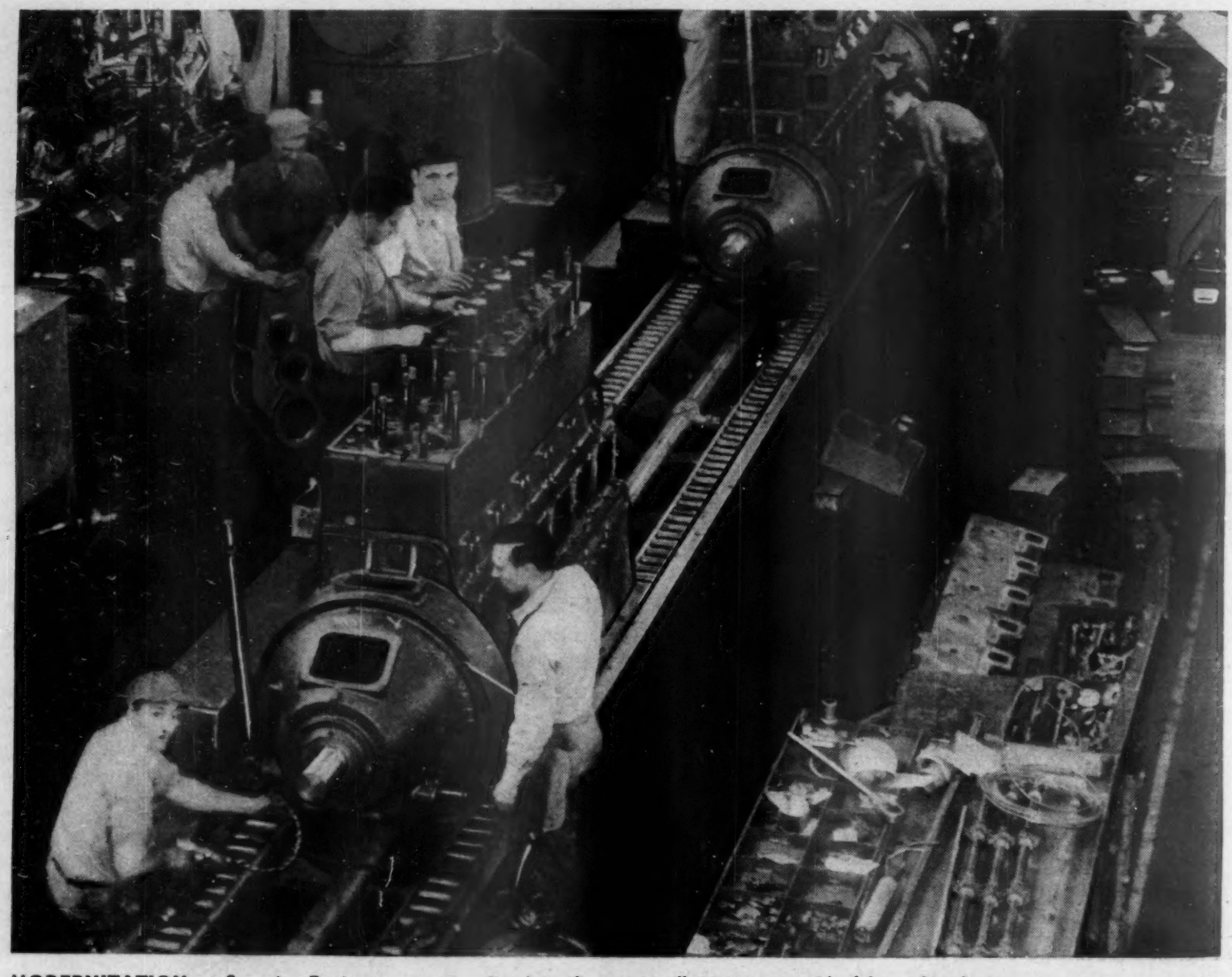
Separate centers were set up for flow-line processing of pistons and liners. Cylinder blocks, bedplates, housings, etc., because of their great bulk and the large size of machines necessary to process them, are all handled through one department, the heavy machine shop. Here the milling, boring, and drilling machines are also arranged to form a continuous flow-line from rough parts to finished stock as far as is practicable considering the size of the parts and the processing machinery.

COLLATERAL DECISIONS. Cleaning operations were formerly carried out at various locations throughout the plant and were a constant source of troublesome dust and grit. A large room at the west end of the machine shop was made into a cleaning room. These operations are now centralized in this one location where dust and grit is collected and disposed of instead of being allowed to permeate the entire plant.

A new progressive assembly line was established for the smaller diesel and the gas engine mentioned before. A 100-foot roller conveyor was mounted sixteen inches above the floor. Benches for assembly tools are provided along one side, and parts racks along the other on which the various parts required at each assembly point could be stored.

Owing to the large size and great weight of the other diesel engines, a moving assembly line is not practicable and individual assembly stands are used.

All completed engines are carefully brake-tested for power over a full range of loads. They are then removed from the test stands, mounted on wooden shipping skids, and moved by crane to the paint booths. After cleaning and painting, they are moved to the shipping room at the far west end of the plant, where they are either boxed for export or securely mounted on flat cars for shipment.



MODERNIZATION at Superior Engine was not confined to the machine shop improvements described in this article. The same program was carried into assembly departments. For example, small engine assembly (shown here) was set up on a progressive basis. All operations are performed on a roller conveyor 100 feet long mounted 16 inches above floor level

OUTPUT PER WORKER AS SEEING CONDITIONS IMPROVED

TYPE OF TAX RETURN	NUMBER OF OPERATORS	AVERAGE CARDS PER HOUR 1945	AVERAGE CARDS PER HOUR 1946	PER CENT CHANGE IN 1946	DIFFICULTY OF RETURN IN 1946
A	16	39.2	36.2	— 7.7	More difficult
B	26	38.6	35.0	— 9.3	More difficult
C	20	35.0	48.1	+37.4	More difficult
D	15	48.6	48.4	— .4	About same as in 1945
E	22	108.0	111.4	+ 3.1	About same as in 1945
TOTAL	—	55.9	59.0	+ 5.5	—

DESPITE INCREASED DIFFICULTY OF RETURNS A, B, C, IN 1946, OVER-ALL PRODUCTION WAS INCREASED 5.5 PER CENT OVER 1945

TEST PROVES BETTER SEEING MEANS MORE PRODUCTION

WHAT happens to the production, welfare, and morale of a group of office employees when their working conditions are improved so that they can see better?

A two-year study of this question was made jointly by the Public Buildings Administration of the Federal Works Agency and the Public Health Service of the United States Government at Washington, D. C. Objectives of the test were:

1. To answer the question in the first paragraph above.

2. To get engineering data needed for future improvement of government offices.

3. To get facts and statistics useful to industrial managers.

For the test, a card-punch subsection of the Bureau of Internal Revenue was chosen. There statistics are assembled by a large-scale business-machine operation. The subsection employs approximately 100 girl workers, and has 86 card-punch machines. The test room has ten bays, approximately 15½ feet by 24 feet deep. The total area amounts to 3,735 square feet. The ceiling is 16 feet high. The walls have an 8-ft.-high wainscot of plaster. Above the wainscot, the walls, ceiling, and beams, are covered by 9x18-in. acoustic tiles.

The three-part study disclosed the influence of lighting, eyesight, and environment upon the output of employees in the department.

PREPARATION

During the period of preparatory work, July 17, 1945, to September 1, 1945, (1) a check was made of employees' eyesight. (2) Conditions existing in the card-punch room were surveyed to determine illumination potentials, what should be painted, and with what colors. (3) Records of individual employees' productivity were kept. (4) Following three surveys, plans and specifications were developed to accomplish necessary changes in prevailing conditions.

The next steps taken were:

1. Between October 1 and November 15, 1945, employees' vision was corrected with eye glasses. A one-month productivity and health survey followed.

2. Between December 15, 1945, and January 7, 1946, lighting was corrected. In place of two fully direct-type fixtures per bay, with a 300-watt incandescent lamp in each, fluorescent fixtures were installed. These were hung in twenty rows, five fixtures in each row. Each fixture was 4 feet long and contained two 40-watt, 3500-deg. K-white fluorescent lamps. Fixtures were hung on 2-ft. stems, and diverted 36 per cent of the light upward, 41 per cent downward. Another one-

BEFORE: CARD-PUNCH ROOM, BUREAU OF INTERNAL REVENUE, WAS TEST ROOM, SHOWN WITH ORIGINAL LIGHTING AND PAINTING

month productivity and health survey followed the installation.

3. Correction of color and brightness contrast was made from February 7 to March 1, 1946. A color consultant made recommendations for changing colors on walls, tiles, furniture, floor, and machines.

Lower walls were changed from soiled tan to light blue green; room trim was changed from wood-grained walnut to blue green; acoustic tile ceiling, upper walls, and beams were changed from tan to off white; the floor covering was changed from dark brown to tan marbleized linoleum. Furniture was changed from golden oak to medium gray green, with light linoleum tops; and card-punch machines, formerly black, were painted gray green. The third one-month productivity and health survey followed.

4. Reaction of employees was obtained by questionnaire on March 27, 1946.

5. A six-month survey of production was made for comparison with a similar period in 1945.

WHAT IT COST

The costs of this program, exclusive of engineering services, are given directly below.

For the estimated 15-year life of the lighting installed, this represents a yearly square-foot cost of $.0969. Room painting, a normal maintenance item, is not included in this figure.

Additional cleaning maintenance is required in the room because of the brighter finishes used on floor and furniture.

A. INSTALLATION		
Electrical fixtures (installed)	$2,579.59	
Rewiring	806.20	$3,385.79
B. BRIGHTNESS AND COLOR CONTROL		
Room painting (normal maintenance)	$1,077.52	
Refinishing furniture, machines	553.97	
New floor (installed)	1,480.50	$3,111.99
TOTAL COST OF INSTALLATION:		**$6,497.78**

AFTER: SAME ROOM. NEW FLUORESCENT LIGHTING. LIGHT-COLORED MACHINES, DESKS, FLOOR COVERING. WALLS. CEILING TILES

RESULTS

Did production increase under the improved conditions? The answer, definitely, is yes.

Exactly how much? On this point, plans of the experimenters were defeated. They had hoped to get an exact numerical measurement of increased production under improved conditions, and could have done so if the work had remained the same in both years. But in the second year, the character of the work changed and became much more difficult. In 1945, "business information" on individual tax returns was not tabulated; in 1946, it was. Before the girls could do their punching, they had to make a virtual statistical audit of the returns.

Numerous written sheets were often attached to the returns in such a way that a given item was not always in the same place as in the case of a printed return. The girls had to find total receipts from business or farm, subtract costs to get gross profit or loss, and finally punch the card. In 1945, none of this was necessary.

Employees estimated that the work was more than 50 per cent more difficult in 1946 than in 1945. Despite this large increase in difficulty of the job, there was an overall improvement of 5.5 per cent in 1946 over 1945. See table which was prepared by the Industrial Hygiene Division, U. S. Public Health Service, and based upon individual productivity records maintained before and after the change-over (shown on page 111).

As of May 17, 1947, the card-punch room had 95 employees and 14 supervisors. The annual payroll amounted to $240,537. In terms of savings on gross payroll, the 5.5 per cent production boost would amount to approximately $13,229 annually. At this rate, the renovation would pay for itself in six months.

The girls were polled for reactions to the change. To the question "Do you like the room painting?", 93.1 per cent said yes; 6.9 per cent said they found it made little difference.

To the question, "Do you like the change in lighting?", 96.6 per cent said yes; the remainder said it made no difference.

Replies received from 88 employees showed that 44.3 per cent were given new glasses, 18.2 per cent were already wearing glasses that were satisfactory, 37.5 per cent did not need glasses.

Employees genuinely appreciated the lighting and painting. Others working in dingy rooms nearby were envious of employees working in the card-punch room and requested similar improvement in their workrooms.

HOW WE CONVINCE 22,000 WORKERS

THOMAS J. CAIN, JR. • DIRECTOR OF SAFETY, THE B. F. GOODRICH COMPANY, AKRON, OHIO

THE WORKMAN was a veteran oiler, and he was breaking in a new apprentice.

"Don't YOU do it this way," he called. "This is just my own system." Whereupon he reached from his ladder to oil one of the few overhead shaft bearings still existing in the B. F. Goodrich plants. A slip, a frantic grab, and his sleeve caught in the revolving shaft. It tore shirt and pants off, and left him, battered and almost naked, in a dangerous spot until an observant workman cut the power.

An empty bottle and a left shoe with a harmless gash above the steel-shielded toe, are two prize exhibits in the BFG safety department. The bottle, discarded by some thoughtless person in a passageway, caused an accident. A man guiding a truck stepped on it, the bottle rolled under him, and the truck crashed through the elevator gates and dropped three floors. No one was hurt, but property damaged was great, and several persons' nerves were upset for the next hour.

The safety shoe was being worn by a foreman. He had stopped to examine a skid-board full of newly processed rubber. The truck operator didn't notice that the foreman was leaning over the truck. The foreman didn't realize that the toes of his left foot reached under the skid. Result—2200 pounds dropped suddenly, and the edge of the skid knifed through into the foreman's shoe. Thanks to the steel safety cap, it didn't even break a toenail.

Safety Effort Doubled

Convincing 22,000 employees that they are *not* different from other people, and that accidents might happen to them, is a tedious job. Nobody likes to be mother-in-lawed. Being "don'ted" is irritating.

Yet BFG felt that safety education is so important that in 1946 it doubled the company's safety program. The drive started then was continued throughout 1947.

In rubber factories a great deal of heavy machinery is used. Chemicals, solvents, and pigments also involve potential hazards. Yet analysis of the safety record shows that the most frequent accidents do not happen in dangerous operations. A small percentage can be traced to unsafe working conditions, although the management works earnestly to eradicate these. The others are caused by thought-

"DO AS I SAY, NOT AS I DO," SAID THE OILER, JUST BEFORE HE SLIPPED OFF LADDER

THAT SAFETY IS THEIR BUSINESS

lessness, or stem from an inborn and stubborn instinct for gambling.

A workman, for instance, was using a knife to trim the edge of a belt he was splicing. The knife grew dull, and he placed it in his pocket to sharpen later. He stooped over to pick up a hammer. Result—the knife cut his hip.

Safety Shoes. The shoe incident described here was featured in the company's employee publication under the title "Should Foremen Wear Safety Shoes?" Safety shoes have prevented so many messy accidents that BFG has gone all out for them. The company's employees' store sells them at cost.

TO THEIR FELLOW-WORKERS, AND TO COMPANY PROPERTY

AN EMPTY BOTTLE, A CARELESS STEP, AND THE TRUCK LANDED THREE FLOORS BELOW

THE LEATHER WAS CUT—THAT'S ALL—WHEN 2200 POUNDS FELL ON THIS SAFETY SHOE

We safety men ourselves all wear safety shoes. The long-time prejudice that steel-toed shoes were uncomfortable and conspicuous no longer holds. Today's safety shoes, except for the broad toes, are neat and trim, and look like any other shoes. They come in black or brown. They take a good shine. Women's safety oxfords are equally comfortable.

So many painful, slow-healing, and bothersome accidents can be avoided if safety shoes become a habit that BFG wages an unceasing war to have them worn throughout the plant. Spot checks are held frequently. "Do you wear safety shoes?" asks a safety observer. If the answer is not a hearty "Yes," the observer wants to know in detail "Why not?" And he writes down the answer.

Goggles are important too. I wear safety glasses made up to my own prescription, and frequently dash them to the cement floor to show that they won't break.

Patrolling for Hazards. Safety observers—six of them—are something new at B. F. Goodrich. These observers, all young men with a friendly manner and no disposition to snoop, try to smoke out potential accidents *before* they happen. They wear white smocks with a green cross on the back. They note down things such as "Workman sitting in mill-pan while mill was in operation," and "Opening chuck with slot down," "Cleaning clothes with air hose," "Horseplay."

Then there's "Having face too close to bung when opening drum," and "Removing stuck rubber from conveyor while it is in operation." Nothing startling, nothing that hasn't been done dozens of times before, and generally without injury. But the gamble is there. And BFG doesn't ask its people to gamble with their lives, their health, or that of fellow-workmen.

A recent safety meeting disclosed 154 unsafe practices noted during a single month. No one pretends that there are not more. And

WORKERS ARE SHOWN THE PROPER WAY TO USE HAND TOOLS IN COMPLETE SAFETY

because no one should be more interested in making work safe than the workers themselves, the company has increased its suggestion pay for safety ideas. Once worth $7.50, now a safety idea can win $25, or more. Safety ideas receive the same publicity and write-ups as do the more spectacular ideas for new products and time and labor saving methods.

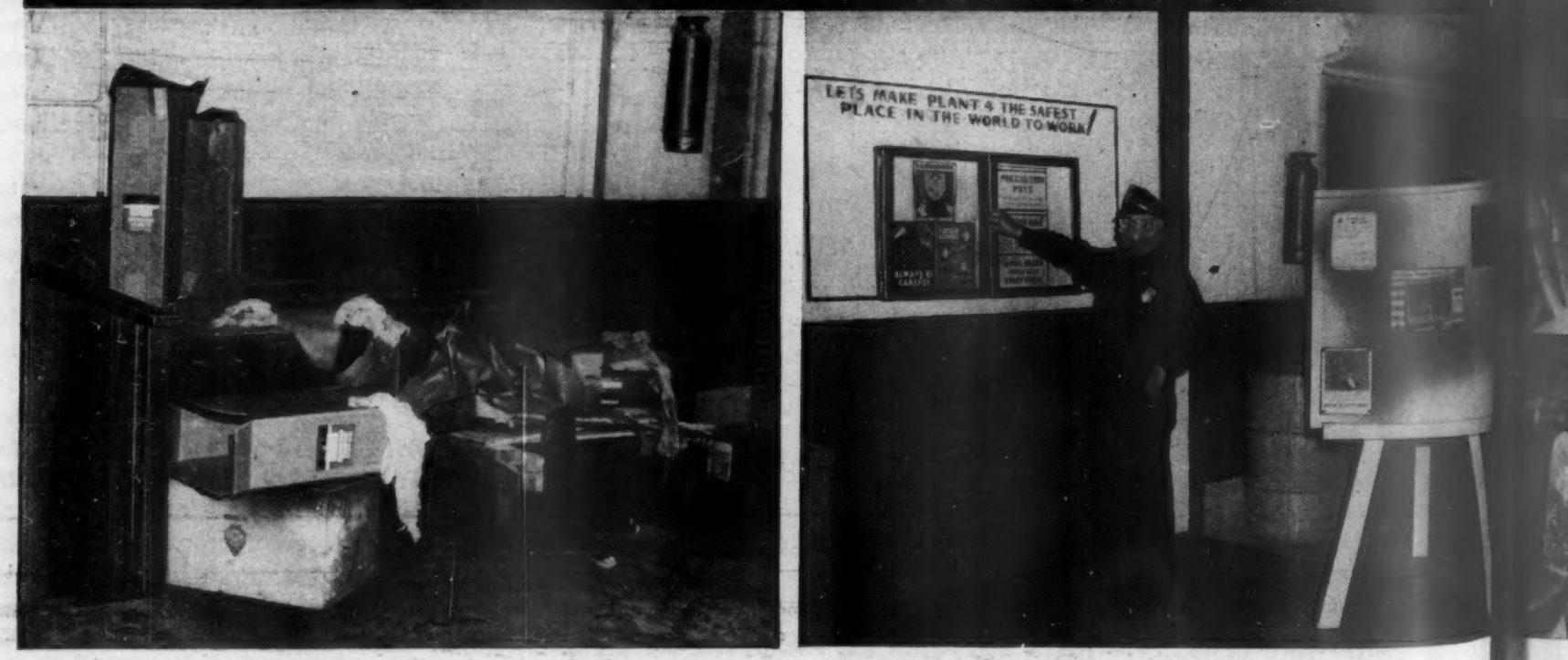
Accident of the Week. Unsafe conditions discovered by the safety observers call for publicity, meetings, and pictures. A weekly item in the B. F. Goodrich *Circle News* discusses "The Accident of the Week at BFG." Here the story of an accident is told simply and effectively, with an explanation as to what should have been done to prevent the trouble.

When negligence sets the scene for possible later accidents, the alert camera man takes his picture, and frequently blows it up to 11x14-in. size. Has someone permitted slippery pigments to form a pool on the floor? Get the picture!

Pictures, too, are used to dramatize and exaggerate dangerous practices—a truckman leaning far back to get his truck in motion, for instance, instead of lifting the skid from the other direction and pushing it. Workmen cutting toward themselves rather than away. Workmen climbing across a conveyor to save a minute or two.

Traveling Exhibit. Pictures plus a pretty girl, herself a BFG worker with ten years of no accidents behind her, form a traveling safety exhibit which has been moved from one department to another in the widespread BFG buildings. This exhibit drives home such surprises as the fact that a sharp knife is frequently less dangerous than a dull one. Why? Because the worker using a dull knife slashes and pounds the rubber, and the knife bounces up and gashes where it hits. A sharp knife cuts the rubber cleanly and quickly.

Good Housekeeping. Safety and orderliness go hand in hand, so we have a continuing program called the good housekeeping campaign. It is no longer a copy-book maxim here that good housekeeping brings about cleaner buildings, hence fewer fires, less upkeep, less deprecia-


TIDINESS AND ORDER HELP WORKERS "THINK" SAFETY. GOOD HOUSEKEEPING IS
LETS MAKE PLANT 4 THE SAFEST PLACE IN THE WORLD TO WORK!

BEFORE—EMPTY CARTONS TOSSED ASIDE JUST NATURALLY INVITE FIRE

AFTER—ASHCAN IS FOR RUBBISH, POSTERS STRESS NEATNESS

tion and repair. Or that orderly handling of materials, goods in process, and finished products saves money in damages that don't happen to costly finished goods. Or that cleaner working conditions bring about greater employee health as well as a mental lift from more attractive surroundings, so that the divisions leading in housekeeping also lead in safety.

Good housekeeping is seldom conspicuous, but it is effective because of its eternal vigilance. In a corner of one building busy packers were in the habit of parking empty cartons and packing materials. This natural fire hazard was corrected by converting the area into a beauty spot that left no room for miscellaneous junk or storage.

Accident-Gram. Finding that over-sized telegraph blanks demand attention, BFG now uses the "Accident-Gram" to report accidents. Whenever one occurs, particularly some mishap not involving personal injury, an immediate report goes to each foreman, in brisk telegraphic language. "Look out for this type of accident in your department," the warning reads, with brief but explicit details. By using these telegraph forms only for messages that deserve screaming headlines, BFG safety men hope to prevent their acquiring any "wolf-wolf" sameness and loss of meaning. And by keeping ahead of new dangers as fast as they develop, the company expects to maintain a long lead over the lads with the stretchers and the bottles of arnica—and hypodermics full of penicillin.

Keeping safety messages newsy and cheerful of course involved bringing in holiday greetings, with pictures suggesting safe ways to trim the family Christmas tree. Also the use of new slogans, such as "Safety thinking soon forms safety habits," "A good safety record is no accident," and a third, "The best insurance is safety."

Following the British custom of putting slogans in jingles, or near-jingles, some BFG genius coined this one:

"To be safe is so simple, why act so dumb, and end up a cripple?"

It doesn't scan. It doesn't rhyme. But it packs a wallop.

Slogans. Safety literature is run off in small batches and is kept up to date. Even the slightest brochure is worked over until it is not only impressive but palatable. No longer, for instance, do you read "Safety Rules and Regulations." Anything smacking of rules is out. A better title, safety men find, is "Safety for You and Yours." No mental sales resistance.

Thinking that employees themselves might have new slogans to offer, BFG has recently awarded handsome prizes for good ones. First prize, a new electric washing-machine, went to a lad for: "The best safety device is the man who heeds safety advice."

The company is always willing to put money on the line for safety education. Recently an evening meeting for foremen promised "door prizes." Out of 867 foremen, 676 came. Winners received an envelope containing a new dollar bill. The envelope read "Safety Pays."

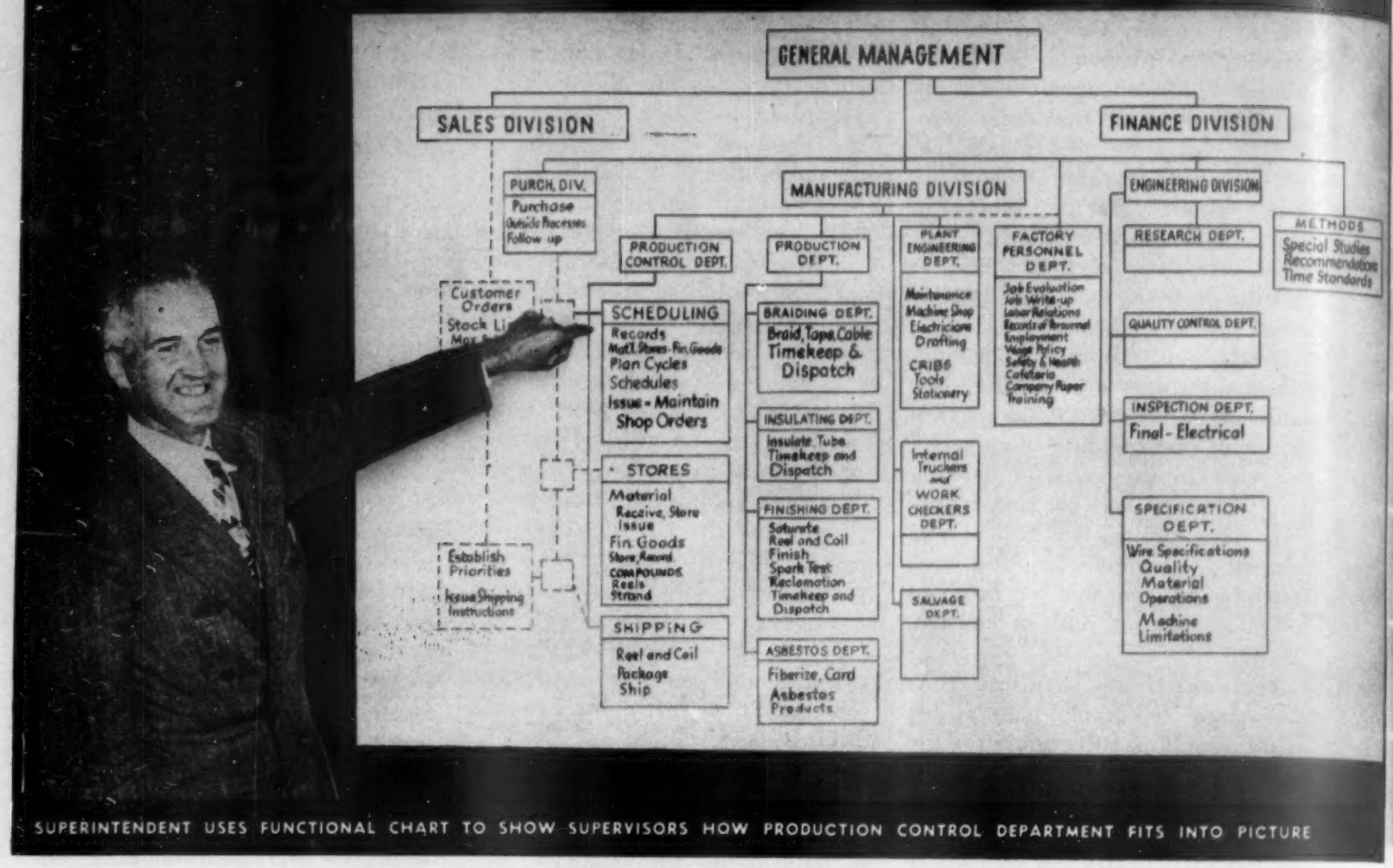
Foreman the Key Man. Everything possible funnels through the foreman. "Even if we saw an employee preparing to jump out of a window, we wouldn't speak directly to him. We'd speak to his foreman." The foreman is the key man in the accident-prevention picture. He is responsible for the safety of every employee. The function of the safety department is only an advisory one, to give guidance in getting the safety job done. No one ever goes over the foreman.

A weekly evening course on safety is now being given to 50 BFG foremen, through the B. F. Goodrich-University of Akron Institute. Foremen are given talks on the cause and cure of industrial accidents. Out-of-town speakers help enliven the programs. In addition, there are frequent accident-prevention movies.

IS STRESSED AT BFG AS BEING ONE OF THE BEST WAYS TO PREVENT ACCIDENTS

BEFORE—SCORES OF UNSAFE PRACTICES AND A DUST HAZARD

AFTER—CLEAN, SAFE, SANITARY—A REAL MORALE-BUILDING CHANGE



SUPERINTENDENT USES FUNCTIONAL CHART TO SHOW SUPERVISORS HOW PRODUCTION CONTROL DEPARTMENT FITS INTO PICTURE

SELLING A NEW PRODUCTION CONTROL

ARTHUR G. NEWTON • PRESIDENT, ROCKBESTOS PRODUCTS CORPORATION NEW HAVEN

SELL your plans to supervisors before you try to put them to work. It's the best way to get off to a good start.

We did it at Rockbestos with a new production control plan. We introduced it to a supervisory force just as we would introduce a new product to our customers. Not only were we able to initiate the system with great success, but we also got some unexpected bonuses.

Rockbestos makes permanently insulated wire and cable, much of it to individual order. More than 7000 different specifications must be considered. This made it imperative that supervisors and employees have a full understanding of the system that controls manufacture of the product.

As a first step in this selling job, a questionnaire was sent to all supervisors. It listed the five phases of the production control problem — scheduling an order, scheduling the work load, ordering and handling materials, production records and reports, and the pay system.

Supervisors were asked two questions on each phase. What was their opinion of the present production control system? What was their reaction to the new plan?

From 34 foremen and supervisors came 199 different suggestions and criticisms — an average of almost six ideas from each man!

Many of these ideas were good enough to be incorporated almost immediately into the new production control system. These improvements were largely on things with which the consultant could not have been familiar. Others among the 199 ideas highlighted weaknesses in the organization. Still others showed the need for additions to the company's employee training courses. The new courses have already been launched, and their benefits, too, may be traced back to the answers on the questionnaire.

Most surprising outcome of the questionnaire was the reaction to the present production control system by the people who originated it and had been operating it. They condemned it — and their own efforts — overwhelmingly. Foremen, for instance, voted 25 to 3 that "better supervision" was needed to reduce failures to follow orders accurately.

Other important discoveries showed:

1. Only 9 of 23 foremen felt confident that they could calculate accurately the maximum incentive pay for a machine operator. But a large majority felt that they should

WHAT THE COMPANY GAINED

1. Better supervisor morale, because foremen were consulted in the development of the new plan
2. First-class suggestions, which were incorporated in the plan, and strengthened it
3. Thorough indoctrination of everybody who would be affected by the new system
4. Clarification of some "fuzziness" in organization lines — a long standing problem
5. Better cooperation between supervision and management

PLAN TO SUPERVISORS

be able to explain the incentive plan in detail and should be able to tell an operator how to reach the maximum.

2. Only 13 of 25 foremen said that they could give an employee a satisfactory answer as to how his pay was figured.

3. Most foremen thought that the average employee did not know beforehand how much his pay check would be.

This first post-war plumbing of supervisors' thinking brought up other sound suggestions. One, overlooked before, was to move the company's three general foremen into one office. There the exchange of ideas and information and the pooling of personnel make for a more effective, harder-hitting supervisory team.

Aside from the suggestions, however, the questionnaire showed that the company would have the full interest and cooperation of all supervisors in making the new production control system work.

When it came to actually introducing the new system, the program was started with a meeting of all supervisors. The post-war shift in customer demands was outlined. The necessity for Rockbestos to continue to produce top-quality wire and cable at minimum costs was emphasized. It was pointed out that Rockbestos had a heavy backlog of orders and an increasing demand for its product.

An order was traced, step by step, from the time the sales department received it until the products were shipped. How production control came into every step was made clear.

These visual aids were used:

1. A functional chart, showing the departments and sections responsibile for each phase in handling and filling the order.

2. An organization chart showing the responsibilities of individuals involved.

3. Several illustrated charts showing the progress of an order through the plant.

Next step in introducing the plan was to line up the functions and internal organization of the newly set up production control office. New functional and organization charts were drawn up for the department, and the people in the department were called into a meeting.

This session followed the pattern of the supervisors' meeting. It concluded with the production control manager showing how the functions of the department were divided and who would be responsible for each function. Again, visual aids were used.

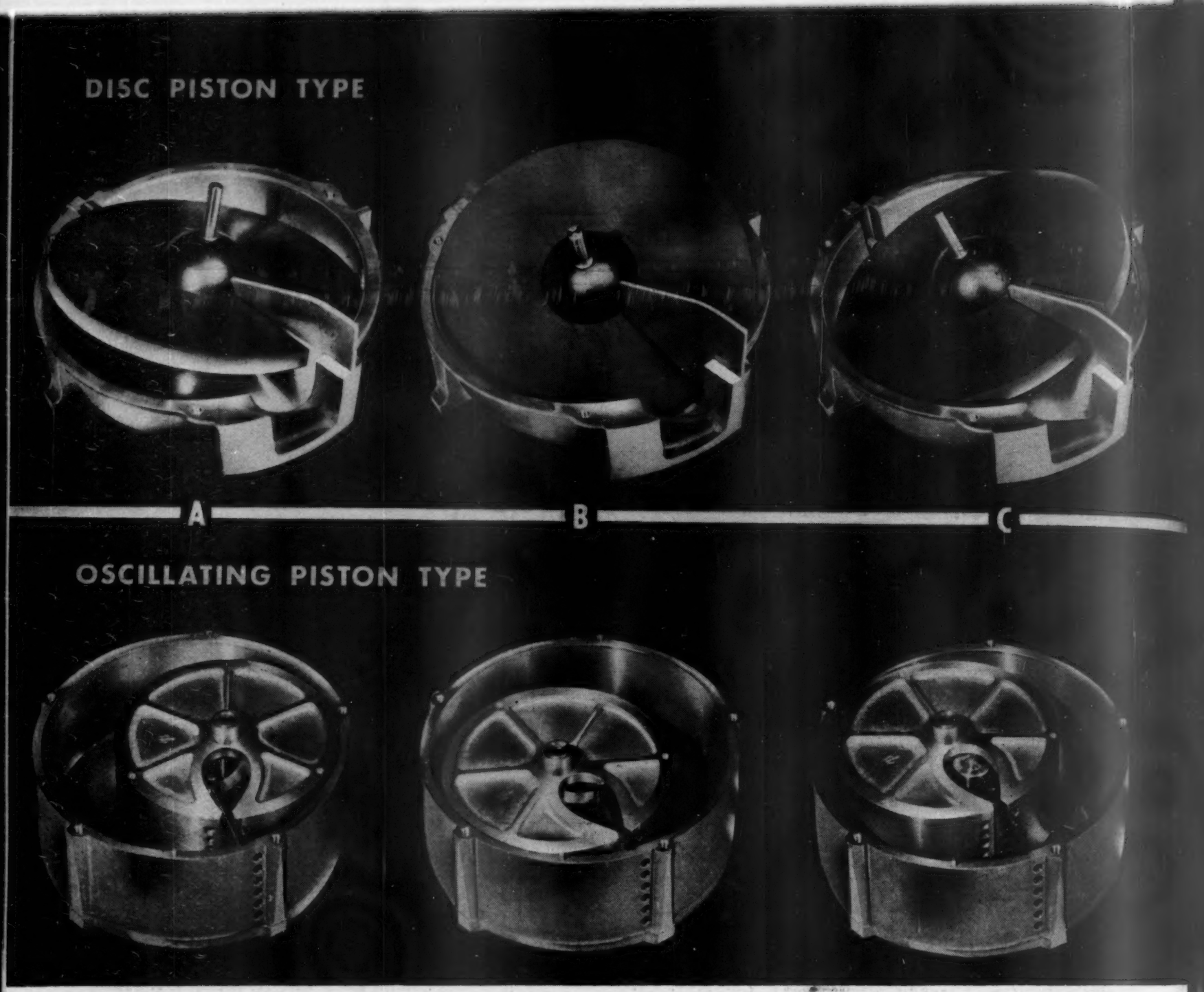
Here what might have been duller than a sermon turned into something resembling the kick-off for a crusade. Even the girls who expected to do nothing but type reports were on their feet asking about details of the new system.

Final step in the introduction was to put over to foremen the working details of the program — how it would affect them in their day-by-day work. That had not been gone into in the first meeting to avoid giving them too much information at one time.

The same informational and instructional techniques were used. Foremen were told — and shown — about the over-all problem. How the production control office would operate was explained in detail.

Technique Pays Off

Although this technique of selling factory supervisors on particular factory problems such as this is new and still being developed, it has paid off for Rockbestos. The company feels that the successful solution of the problem depended mainly on the sincere interest and understanding of Rockbestos people. But the original survey, the questionnaire to foremen and the suggestions it brought, and the simple educational aids and techniques, were excellent tools to develop the solution and enlist full support for it.



HOW TWO MAIN TYPES of rotary displacement meters operate. Views of open casings show positions of rotating elements for each 120 degrees of one revolution. Diagrams on facing page show paths of axes of disc top and piston bottom

ROTARY DISPLACEMENT METERS—THEIR USES AND ABUSES

CHARLES S. HAZARD • DIRECTOR OF RESEARCH, NEPTUNE METER COMPANY, NEW YORK

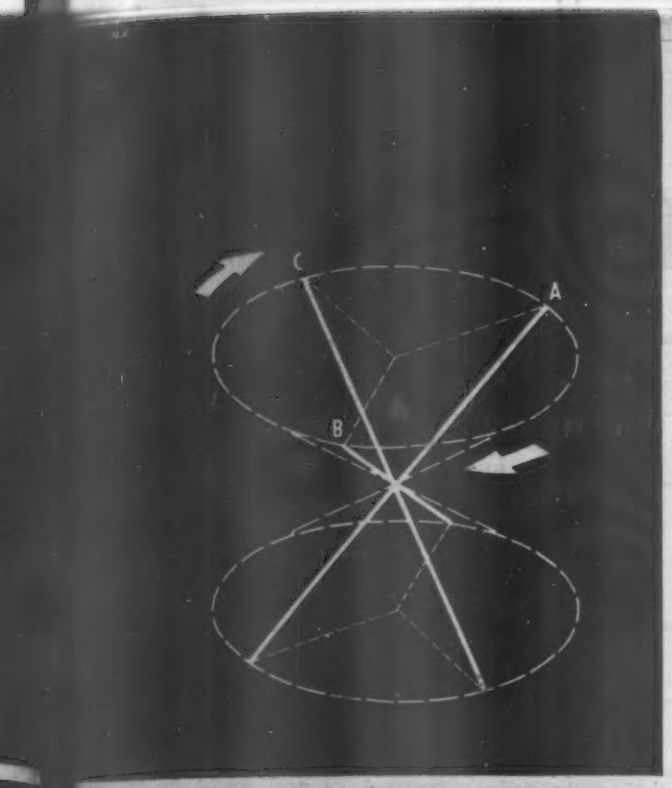
BECAUSE a rotary displacement liquid meter looks like a piece of plumbing, it is too often ordered by pipe size, cut into the line like a valve, then neglected until somebody notices that it has stopped.

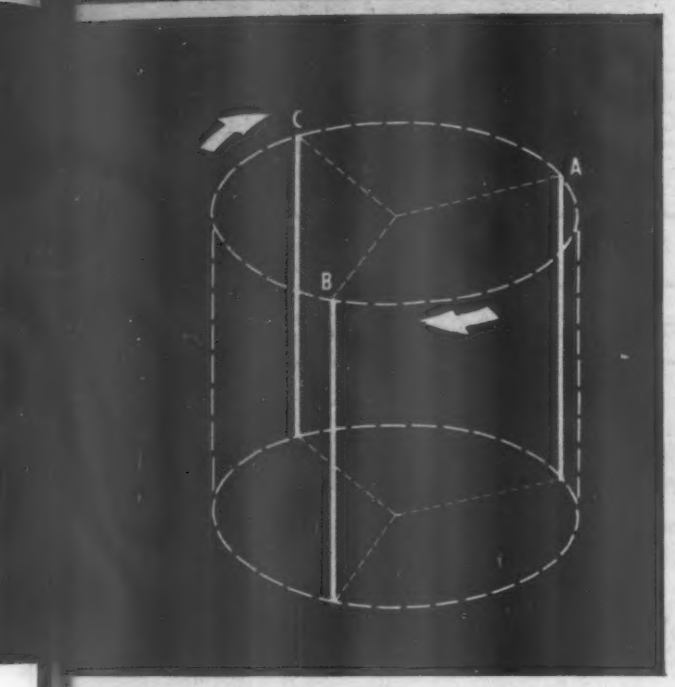
Actually, such a meter is a precision measuring instrument capable of many years of dependable service. To give accurate readings throughout its life, however, it must be carefully selected, properly installed, and regularly maintained.

It is well, therefore, first to know what a rotary displacement liquid meter can and cannot do. Since it measures total volume, its particular field is any application where control is based upon volume rather than upon rate of flow. As such, it has found wide usage in industry for measured dispursement of liquids in processes, for consumption control, and inventory control. It also commends itself to these functions because it is easy to clean, has a low pressure drop, and is not affected by water.

All chemically inert liquids of reasonably low viscosity, and many others, can be metered by a rotary displacement meter. These include such liquids as water, vegetable oils, petroleum products, syrups, acetates,. lacquers, paints, and soap solutions.

In general, rotary meter applica-





tions fall into two categories, each requiring different types of meter registers:

1. Simple measurement of varying quantities (usually in conjunction with manual controls), or measurement of consumption in continuous processes.

2. Automatic batch control, obtained either by a meter that measures out a given volume and then stops the flow, or by a meter that operates an electric motor, interlocked control, or signaling device when enough has been delivered.

There are two types of rotary displacement meters in general industrial use, the disc piston type and the oscillating piston type, shown on facing page. In both types, the liquid passing through the meter displaces a rotary piston in an annular chamber. In the disc type, the piston takes a nutating motion. In the oscillating type, the piston oscillates around the walls of the circular chamber.

In both types the movement of the piston is transmitted through sensitive, low-friction, reduction gearing to a counter or register mounted above the chamber. In its simplest form, this register shows an accumulative total. This type of counter is used for keeping records of the amount of liquid flowing through the meter to a given destination each day, week, or month. An example is the meter used for domestic water supply.

For operations involving batching, a clock type of indicating register is available, having hands that can be set to zero at the start of each batch. This type may also include an automatic cut-off mechanism which will close a spring-loaded valve after a predetermined quantity of liquid has been delivered. It is widely used for batch mixing and for filling large containers.

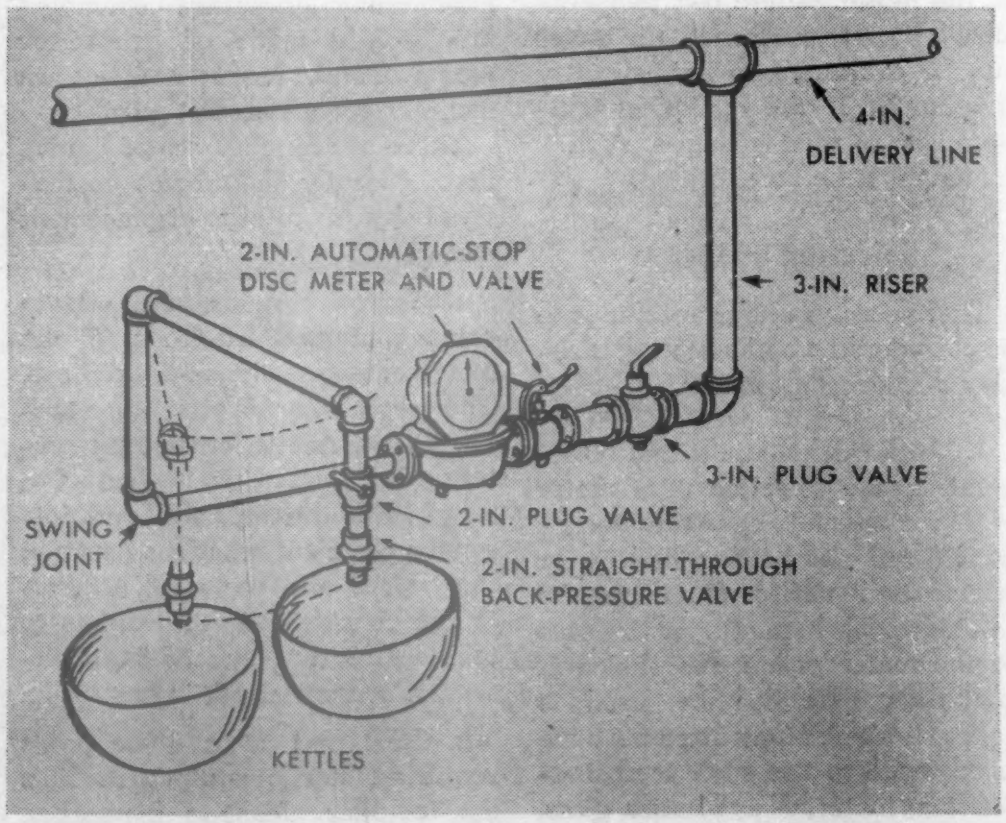
Dials are available for repeating the same quantity time after time without resetting, or for delivering selective quantities as preset before each delivery. Flow of liquid can be stopped in the middle of the delivery without interfering with the setting of the dials. When the valve is re-opened, the meter will continue, stopping automatically when the correct total is reached.

Another type of register incorporates an electrical contact which closes after a preset quantity of liquid has passed. This control can be used to operate a signal or close a valve through an electrical relay. It is extensively used for controlling the operation of water-treating equipment.

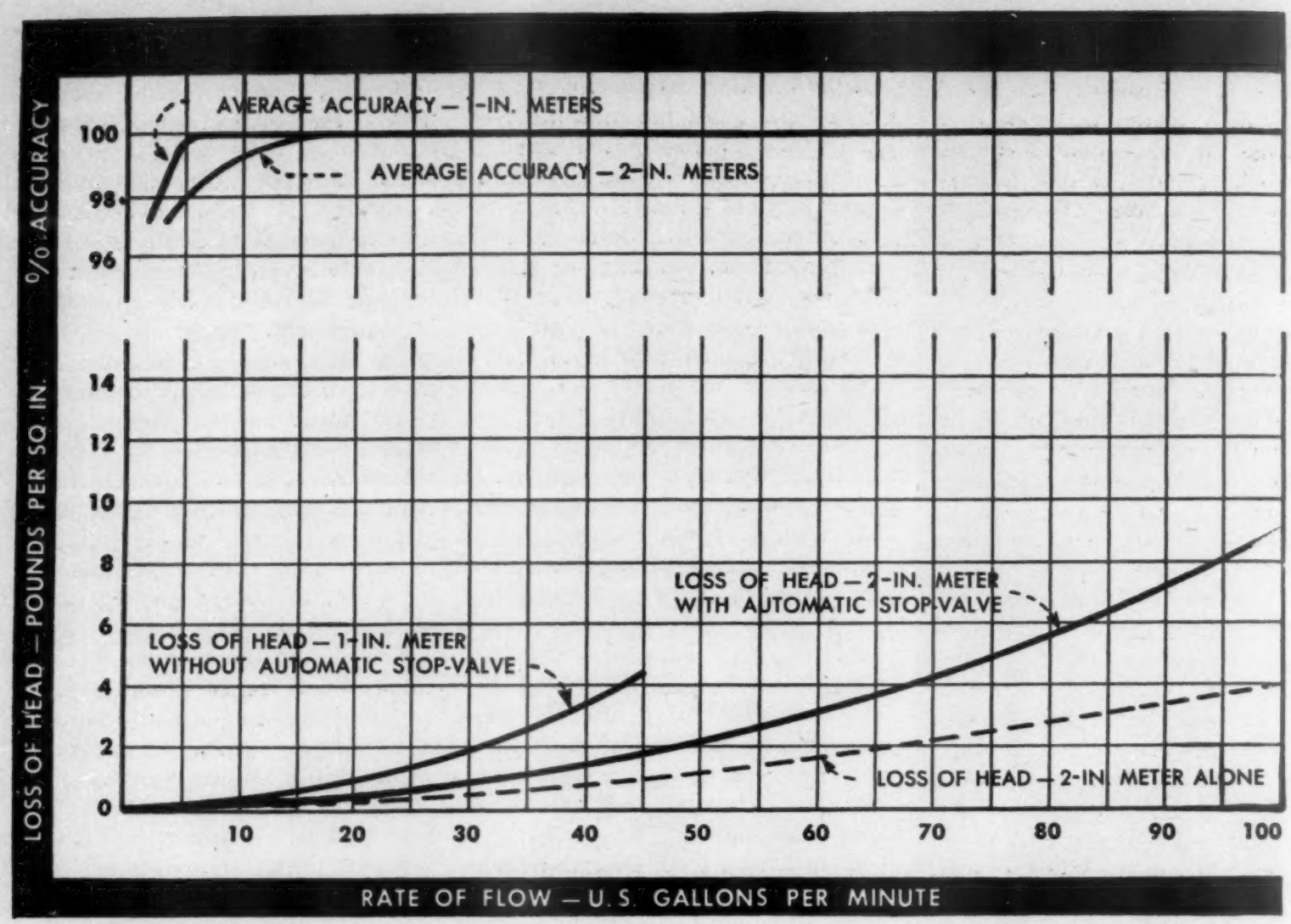
The accuracy of registration of a positive displacement meter depends upon several factors, the most important of which is constancy in the rate of flow. The disc type of meter, with hard rubber piston, is accurate within plus or minus two per cent when measuring water at widely varying rates of flow. If the rate of flow does not vary, the same meter can be calibrated to register within plus or minus one-half of one per cent. This compares with an accuracy within plus or minus two-tenths of one per cent for the oscillating type used in the sale of petroleum products.

Variation in operating pressure has very little effect on the accuracy of the meter, except as it affects the rate of flow. When metering liquids of higher viscosity, the accuracy will in general be better than for lower viscosity.

Since rotary displacement meters



A GOOD METERING SYSTEM keeps meter and piping full of liquid. When meter discharges into an open tank, piping on outlet side always drains to the same point



LOSS-OF-HEAD AND ACCURACY CURVES for typical 1-inch and 2-inch rotary meters—for liquids with viscosity of water—show why rate of flow is an important factor in selection. Matching the size of connecting piping is not a safe method

register on a volumetric rather than a weight basis, the weight of liquid delivered for a given reading will vary with the temperature of the liquid. Where this temperature is closely controlled, the meter can be calibrated to read directly in pounds. If the operating temperature is then changed, such a meter must be recalibrated.

Selection of Meter

There are five important things to be considered when selecting a rotary displacement meter.

1. ***Material composition.*** First point in the selection of a meter is that it be made only of materials which will not be attacked by or which will not contaminate the liquids to be metered. In the case of the meter piston, the choice of materials that can be used is rather limited. Many attempts have been made to use such corrosion-resistant materials as plastics, glass, ceramics, or the rare metals, but all these have proved impractical. For accurate measurement it has been found necessary to limit the choice of piston material to wear-resistant hard rubber, graphite, or aluminum. Measuring chambers are usually made of bronze or monel metal. Meter casings are made of bronze or cast iron.

There are four classes of liquids that generally should not be metered by a rotary displacement meter:

a. *Corrosive acids,* and certain acids contained in foods, if the meter contains copper-base alloys. The corrosive acids attack the copper alloys. Acetic, citric, and certain other food acids, if allowed to stand in the meter, may form poisonous chemical reactions between the copper and the acid, necessitating considerable precaution to make sure that such contamination, if present at all, is negligible.

b. *Milk and some other foods* requiring sterile equipment. This list includes alcoholic beverages, castor oil, liquid chocolate, cocoa butter, cod liver oil, marshmallow, olive oil, and vanilla extract. However, rotary displacement meters can be used in pipeline cookers or other operations where the liquid is to be cooked or sterilized *after* passing through the meter.

c. *Liquids containing solids* in suspension, such as paint or lime-sulphur spraying solutions. The solids, if present in considerable amounts, may settle out in meter chamber during shutdowns. These solids may be difficult to clean out, or may cause damage to the meter when the system starts up again.

d. *Molten solids* that might solidify in the meter during brief shutdowns. Example is molten tar. However, many soft solids heated to reduce viscosity can be metered with certain precautions.

2. ***Rate of flow.*** Next in importance in the selection of a meter is its rate of flow. For each size and type of rotary meter there is a maximum and a minimum rate for which the meter is suitable.

Always carefully determine the

rates of flow to be encountered on the installation, and choose the size of meter to correspond. The use of too small a meter will result in breakage or excessive wear of the working parts, while the use of too large a size will result in loss of accuracy at low rates of flow. The correct nominal size of meter frequently turns out to be larger or smaller than the size of the piping on which it is to be installed, but this is no matter for concern.

The addition of a meter to an existing piping system without an increase in the operating pressure will inevitably cause a decrease in the rate of flow. Check the pressure drop at the desired rate of flow through the size of meter selected, and compare this figure with the pressure available. As the viscosity of the liquid increases, the loss of head through the meter will increase. The meter manufacturer can supply data on loss for liquids of various viscosities. To keep down the pressure drop, it may be necessary to select a larger size of meter.

3. ***Maximum temperature.*** The maximum temperature to which the meter will be exposed must also be considered. Rubber-composition pistons have been developed to withstand temperatures up to 150 degrees F. For temperatures up to 250 degrees F., graphite pistons can be used, but these do not have the toughness of rubber, and therefore cannot be operated at as high rates of flow.

For metering petroleum derivatives or similar solvents, aluminum pistons give the best service, provided neither water nor alkalies are present. Meters so equipped have a still narrower range between the allowable minimum and maximum rates of flow.

4. ***Operating pressure.*** The rotary displacement meter will function accurately at high pressures, many being in use on petroleum pipe lines operating at 1000 to 1500 psi. In the sizes used industrially, liquid meters are ordinarily supplied with casings to withstand 125 psi. working pressure, although most manufacturers can also supply casings for higher pressures.

5. ***Cleaning provisions.*** Another important factor in selecting the type of meter is the method of flushing out or cleaning the liquid line. Choose a meter able to withstand the solvents or cleaning solutions used, and adequate for the rates of flows and temperatures at which these cleaning solutions are to be applied. For instance, an aluminum piston may be suitable for the material to be metered, but if the line is to be flushed out with caustic solution, the aluminum piston is unsuitable. Similarly, steam cleaning of the line may race the meter too fast, or may overheat it, necessitating either a by-pass around the meter or other provisions to clean the meter without damage.

Installation Instructions

On liquids which may carry grit or other solids in suspension, install a suitable strainer upstream from the meter, to prevent jamming or breaking the closely fitted piston, or impairing the accuracy of the meter. Wherever possible, flush out the entire system before installing the meter.

Keep the liquid being measured free of air, since a displacement meter registers air as liquid. An air release unit can be supplied by the meter manufacturer for use on liquids of low viscosity. With high-viscosity liquids, design the system so as to keep air out of the liquid. Do similarly with liquids that crystallize or oxidize in contact with air, for these liquids do not permit the use of an air release.

In general, any metering system must be designed so that the meter and its associated piping are always full of liquid, and the system does not drain back when shut down. Otherwise, the meter will run backward during the drain-back, and record incorrectly on the first delivery when starting up.

The best practice is to arrange the piping so that the metering system will be naturally "trapped." This obviates dependence upon check valves to prevent drain-back. Where the meter discharges into an open tank or kettle, arrange the piping on the discharge side of the meter so as to drain to the same point on every delivery. Back-pressure valves are often used for this purpose.

If the line upstream from the meter is long, and rates of flow are high, it is advisable to install the control valve on the inlet side of the meter, to protect the meter from shock pressure. This is particularly true when using spring-loaded control valves.

On continuously flowing lines, always provide valves for shutting off and by-passing the meter, to facilitate maintenance.

Install the meter so that its casing is not exposed to strains originating in the piping. Such strains may be caused by changes in temperature, or by rigid attachment of the piping to the structure of the building. Particularly on long lines carrying heated liquids, it is advisable to install the meter on a loop or by-pass, with sufficient elbows or bends to relieve the casing of expansion strains.

Maintenance Hints

To maintain proper rates of flow, clean strainers in the meter line frequently. The change in rate of flow resulting from a clogged strainer may be great enough to cause a change in accuracy of registration of the meter.

An essential part of meter maintenance is the periodic checking or "proving" of the meter. These checks are made by discharging the liquid from the meter into a container of known capacity, or into a weighing tank. For accurate results, the meter must be proved under the same conditions as exist during normal use. The rate of flow, pressure, and temperature must be the same, and the discharge point must be that normally used.

If the meter fails to run, open and clean it immediately, and look for damage. If the liquid being metered has a tendency to harden, clean the meter after each run, or flush it with water.

Do not expose any part of the meter to cleaning solutions that will attack or corrode the material of which it is made. Do not expose rubber parts to temperatures over 150 degrees F.

NEMA STANDARDS FOR INTEGRAL-

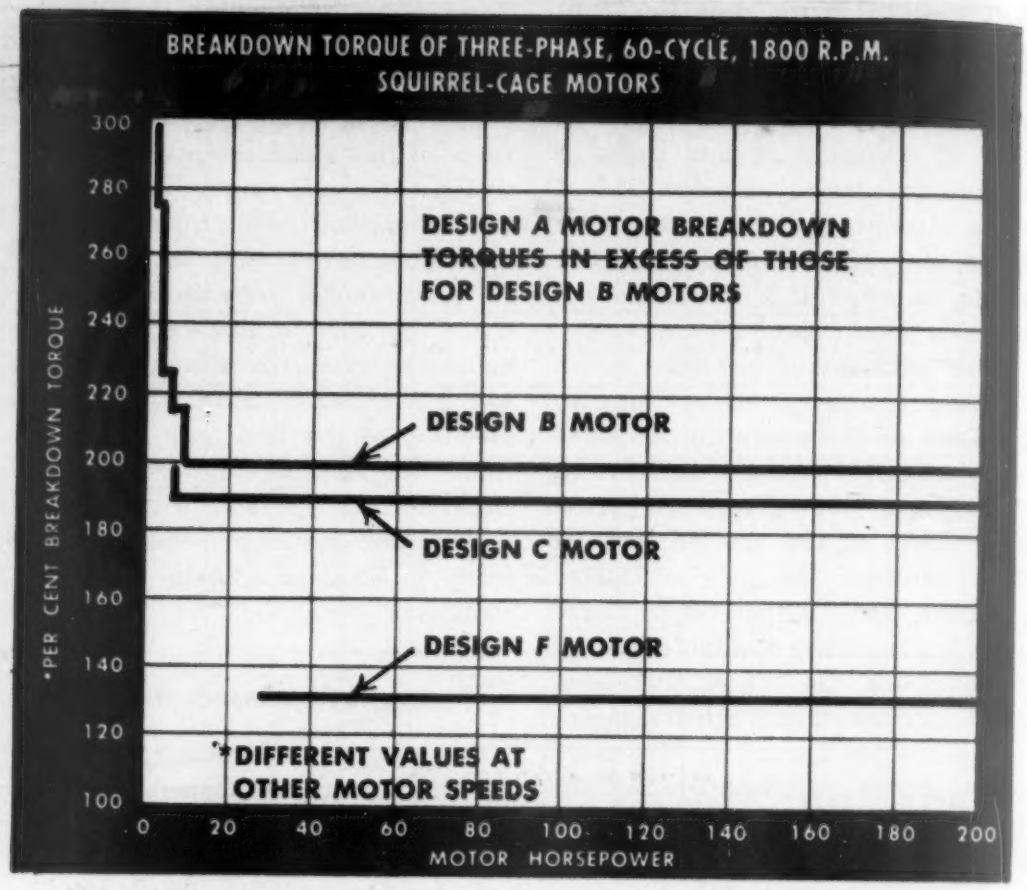
NEW performance standards for industrial-type integral-horsepower, three-phase squirrel-cage induction motors of 1 to 200 horsepower have been announced by the National Electrical Manufacturers' Association. These standards, effective Jan. 1, 1948, are designed to place in the hands of the purchaser:

1. A ready means of specifying minimum acceptable limits of operating performance.

2. A means of being assured that motors made by various manufacturers will start and drive the load in a satisfactory manner.

3. Assurance that motors built to these standards will be acceptable to most power companies to whose lines they may be connected.

4. A clear definition, which makes for comparatively easy selection, of five different types of motors to meet varying types of loads.



Each of the five designs—A, B, C, D, F—offers a different combination of torque, speed, and current characteristics to meet the operating requirements of various industrial applications.

It is the intent that motors built to these standards will be identified as so conforming by suitable designations on the nameplates.

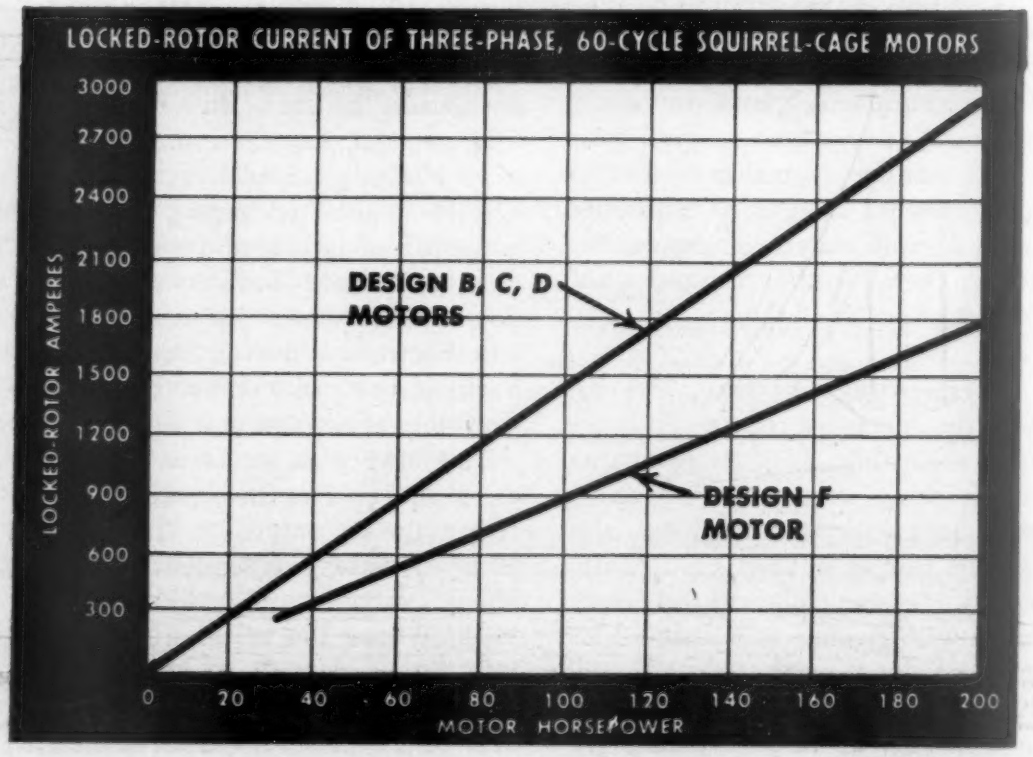
Most popular of these standardized types are Designs B and C. Design B has normal starting torque adequate for a wide variety of industrial drives, and a starting current usually acceptable on power systems. The Design C motor has higher starting ability for such applications as loaded compressors, conveyors, and the like. Design A provides exceptionally high breakdown torques, but these are obtained at the expense of high locked-rotor currents, which normally require provision for starting on reduced voltage. Design F motors have exceptionally low values for both breakdown torque and locked-rotor current.

In Design D, a high-resistance-type rotor is used to obtain variation of speed with load, which is desirable for some applications that impose rapidly fluctuating loads. This type also gives extremely high starting torques with moderate starting currents.

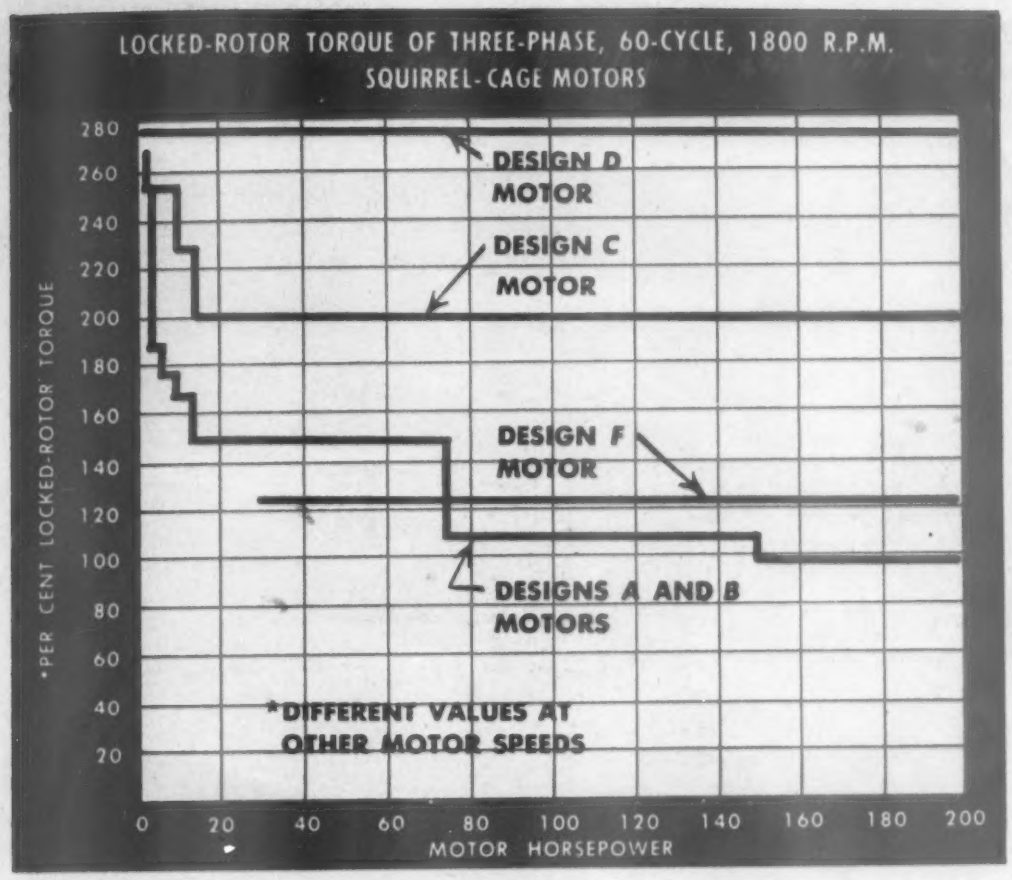
The relatively constant speeds under varying load conditions required in most applications are provided in the other four designs, which have slip values of less than five per cent.

Locked-Rotor Current

Squirrel-cage induction motors have the characteristic of drawing large inrush currents when they start. Locked-rotor current is not identical with starting current, but it indicates the current that will be drawn from the line in starting. The standards state that all five



HORSEPOWER INDUCTION MOTORS



types of induction motors are designed to withstand full-voltage starting directly across the power lines. This means that the motors are mechanically strong enough to withstand the magnetic stresses and the high locked-rotor torques developed at the time the switch is closed.

In the case of Design A motors, however, the locked-rotor currents are such that power lines of exceptional capacity are required, or the motors should be started with reduced voltage in order to reduce the locked-rotor current. Motors of B, C, and D design are believed to be suitable for use on the usual power lines.

Design F motors can be used on weaker than normal lines, but other characteristics of these motors have been compromised to permit this.

Locked-rotor currents for Designs B, C, and D motors drop from a value of about 24 amp. per horsepower at 1 horsepower to a value of 14 amp. per horsepower at 10 horsepower. The locked-rotor currents for Design F motors are approximately 9 amperes per horsepower.

Breakdown Torque

Breakdown torque is the maximum torque that a motor can deliver without abrupt decrease of speed. Ordinarily it can be considered as the maximum torque the motor is capable of delivering. It is usually expressed as the percentage of the torque the motor would deliver when operating at rated speed and horsepower. Hence, the percentage breakdown torque gives a direct indication of how much overload can momentarily be placed on a motor. Maintained voltage and frequency are, of course, assumed, since all torques of an induction motor vary directly as square of voltage.

The values of breakdown torques specified in the standards represent the upper limit of the range of application for the various classes of motors. If an application requires a breakdown torque higher than that shown for any given rating, the next larger rating is recommended.

No breakdown torque values are given for Design D motors, since they have no sharply defined breakdown torque.

There is a very close relationship between breakdown torques and locked-rotor currents. For example, Design A motors have exceptionally high breakdown torques, but at the expense of exceptionally high locked-rotor currents. Design F motors have exceptionally low locked-rotor currents but also have exceptionally low breakdown torques.

Locked-Rotor Torque

Locked-rotor torque is the torque developed by the motor while at standstill. It is also called the starting torque. Usually it is expressed in percentage of full-load torque. Locked-rotor torques for the various designs of motors are established by these recently approved standards and, as in the case of breakdown torques, these represent the upper limit of the range of application for the various designs of motors.

Design F motors have the least locked-rotor torque, A and B next, C next, and D the highest. Higher locked-rotor torques for the smaller horsepower motors can rather easily be obtained, since higher locked-rotor current limits are permissible. It is, therefore, possible to have the Design B motor perform on applications for both Design B and C motors in the lower horsepower ranges, and the Design C motor need not be standardized below three horsepower.

Motor Slip

If an induction motor is operating at no load and rated load is then applied, its speed will decrease. This change of speed is known as its slip at full load, and is usually expressed in per cent of no-load (or synchronous) speed. In most applications, a constant speed (low slip) is desired. Motors of designs A, B, C, and F are defined as having slip at rated load of less than five per cent, with the exception that motors having ten and more poles (very low speed) may slightly exceed 5 per cent slip.

OPERATING SHORTS

Readers are invited to contribute brief articles, illustrated when possible, reporting out-of-the-ordinary operating accomplishments. Accepted articles will be paid for

PREVIEW OF CATALOG BUILDS GOOD WILL

Copies of its new 24-page catalog were recently mailed to the homes of all company workers by Radiant Manufacturing Corporation, Chicago. Along with the catalog went a letter signed by the plant manager, A. F. Pieper, and addressed to the individual employee, which read:

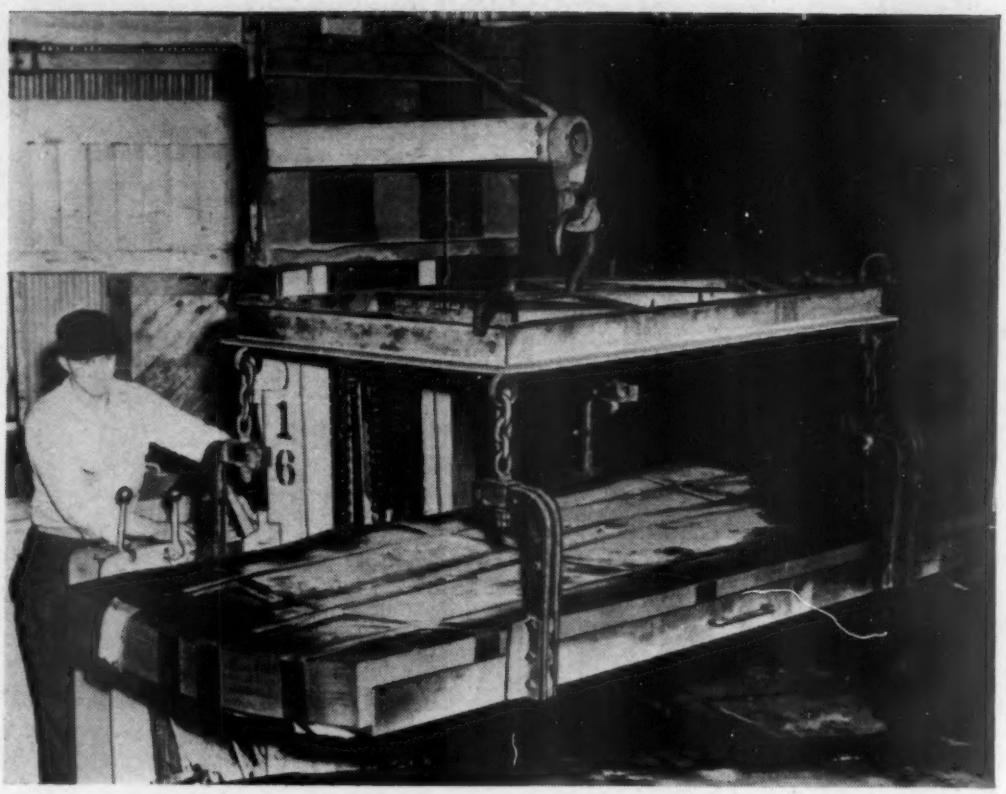
"Here's your preview of the new Radiant Catalog which will be mailed during the coming weeks to thousands of dealers from coast to coast.

"You will find it mighty interesting, too, since you and the rest of the gang have helped in bringing Radiant to the leadership of its field.

"As you glance through the pages of the catalog, you will see the important part your job plays in the over-all pattern . . . how careful engineering, designing, and production methods all add up to a superior product!

"To retain our hard-won leadership . . . to keep on producing the best screens for an ever-growing public demand . . . these are the goals of the Radiant Manufacturing Corp.

"Remember! Your comments and suggestions will be valuable in maintaining these goals."



Packages of sheet steel weighing up to 6000 pounds can be handled by grab carrying device developed at American Bantam Car Company, Butler, Pa. It takes less than two minutes to remove storage-battery-powered truck's forks and substitute the carrying device. Forty tons of packaged steel can be moved from the receiving dock and placed in the warehouse in two hours by one truck operator and two helpers

Plenty of light and a minimum of maintenance are provided by lamps specially designed to withstand the effects of shotblasting. Lamps are 5 feet apart, direct illumination downward at 45 degrees

SPECIAL LAMPS FOR SHOTBLASTING ROOMS

SOURCE: General Electric Company, Erie, Pa.

Shotblasting operations are hard on lamps. Standard industrial reflectors are quickly damaged by the work, yet there is need for uninterrupted light. This problem has been solved at the Erie Works of General Electric by a special lamp, with a reflector built into the inner surface of a heavy heat-resistant envelope.

Although shotblasting, used in processing cast or welded metal parts, is frequently carried on in small booths, the manufacture of electric or diesel electric locomotives involves its use on a very much larger scale.

At the Erie Works a separate building was constructed for the purpose. It required a lighting system proportioned to the size of the operations. The building is 87 feet long, 18 feet wide, and 20 feet high. Lamps are located on the walls at two levels above the working floor — 16 feet and 10 feet. Lamps are placed 5 feet apart and mounted to direct the illumination downward at 45 degrees.

SPECIAL DOLLY FOR GRINDING WHEELS

RALPH MORIN, Maintenance Superintendent, Boston Gear Works, Quincy, Mass.

A specially designed dolly has been found helpful in transporting heavy grinding wheels at Boston Gear Works. It has been built so that the platform is level with the racks in which the wheels are stored, so the wheels roll easily onto the dolly. Once in place, a wedge is slipped under the wheel to keep it from slipping off while it is being moved.

The sides of the uprights on the 4-wheeled dolly are cut away so that it is easy to attach the lifter which is used to place the wheels in position. This eliminates all hand lifting.

Another improvement that has been made is in the design of the storage racks. The floor of these racks is inclined slightly downward toward the back, so that when the wheels are returned to their bins, they roll easily into place. The upright separators between the wheels are cut away, so that they may be reached from the side when necesary.

●

EXHIBIT OF PRODUCTS SPARKS WORKER INTEREST

An animated display of completed products helps workers at Westinghouse Electric Company, East Pittsburgh, visualize the scope of the company's operations. The display, changed every month, is open daily at the main plant, and may be seen by students, salesmen, and visitors, as well as Westinghouse employees.

Many of the devices actually operate, and are equipped with meters to help visualize what they do. For instance, a capacitor mounted in an operating circuit can be cut in or out by the push of a button. Meters and illuminated figures show exactly how much power factor and other electrical qualities are affected by its use.

When the incoming live steam line in this tire-mold processing department was being insulated, an extra length or two of the formed mineral wool pipe insulation was installed to shoulder height on the condensate return line (arrow). Leaving the condensate return line bare is likely to result in burns to personnel. Note also the control card hanging on the incoming line. It is used to record curing "time in" and "time out." The operator does not have to rely on his memory as to when to take the cure out. Source: Industrial Mineral Wool Institute

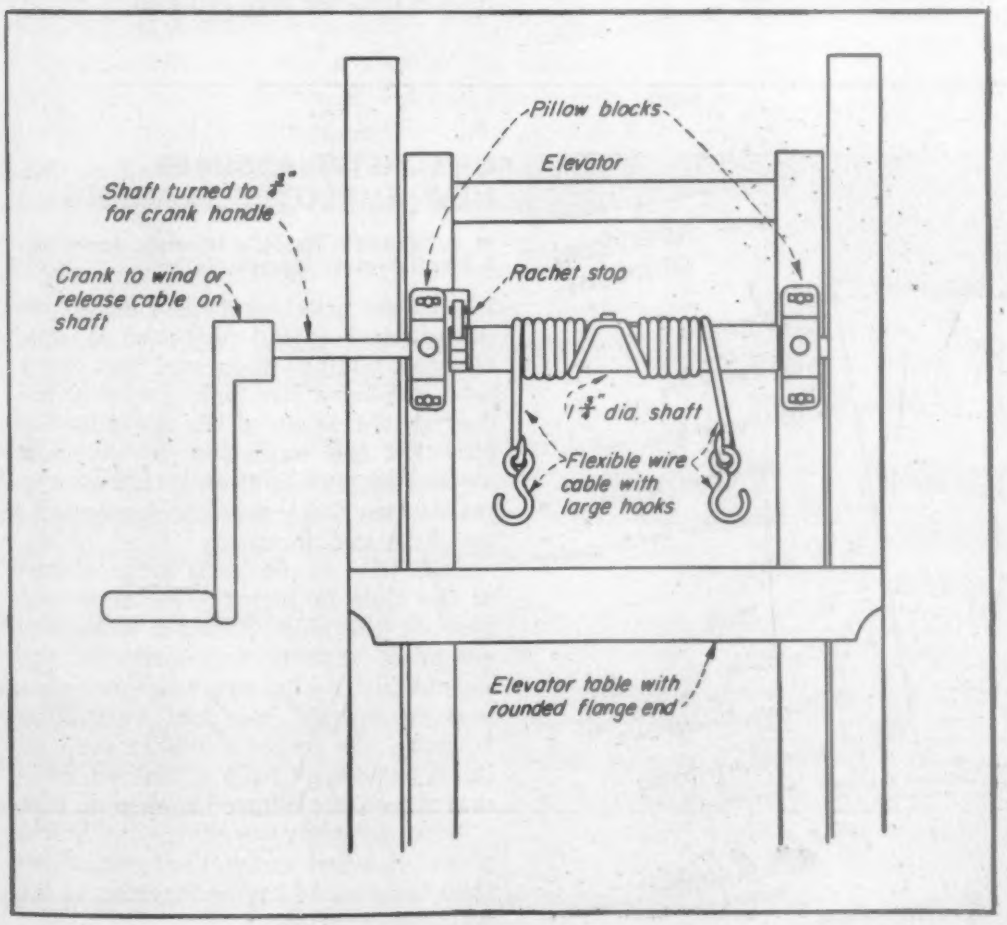
QUICK, SAFE DIE-SPOTTING WITH WINCH ON SHOPLIFT

A. B. YEAGER, Plant Industrial Engineer, The Peerless Electric Company, Warren, Ohio

Since the installation of a winch with flexible wire cables on the shoplift in our punch press department, many hours of labor have been saved each month. Only one man is now needed to spot dies with the new attachment, where formerly two were required.

The flexible wire rope cables have hooks on the end, which pull the heavy die sets onto the table of the shoplifter. After the shoplift elevator has been raised to the level of the top of the press bed, a turn of the winch lifts the die set slightly so that it may be easily lowered into place directly onto the press bed.

After the dies have been spotted, the die sets may easily be removed from the press bed in any direction by one man through the use of the winch attachment. The chances of injuries to workmen and man-hours lost have been greatly reduced by the use of this new method.


Pillow blocks
Elevator
Shaft turned to 1" for crank handle
Crank to wind or release cable on shaft
Rachet stop
1 1/4" dia. shaft
Flexible wire cable with large hooks
Elevator table with rounded flange end

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PAID SICK LEAVE HAS ACCUMULATION PRIVILEGES

R. CONKLIN, Personnel Director, National Pneumatic Company, Rahway, N. J.

For the past two years our company has included paid sick leave provisions in its contract with the union (District 50, United Mine Workers of America). All employees are entitled to six working days' paid sick leave. Employees are not expected to use this privilege unless they are ill to the extent that they cannot perform their duties. In this event, they are expected to sign a written form certifying such illness. Doctor's certification is not necessary. The honor system is in effect.

When this privilege was first granted, both company and union recognized that it was abused by some employees. The current contract pledges the cooperation of the union in elimination of such abuses by an educational cam-

paign advocating proper use of this privilege. Incidentally, the company nurse makes calls daily at homes where it is felt her advice might be needed.

Further encouragement to non-abuse of the privilege is the clause experimentally inserted in the current contract for accumulation of unused sick leave. Any employee may accumulate or carry over any unused portion of sick leave of the last contract year for use in the current year. Such portion can be applied after he has first used his regular six "honor" days. He is entitled to the accumulated leave, moreover, only if upon return to work after an illness he files with the company a doctor's certificate.

At the end of the current contract, both the sick leave and accumulated provisions will be jointly surveyed by the company and the union. If it is found that these privileges have been abused by a substantial number of employees, it is contractually understood that they will not be renewed in future contracts. Under such cooperative guidance the responsibility for the plan's success therefore rests squarely on its beneficiaries, the employees.

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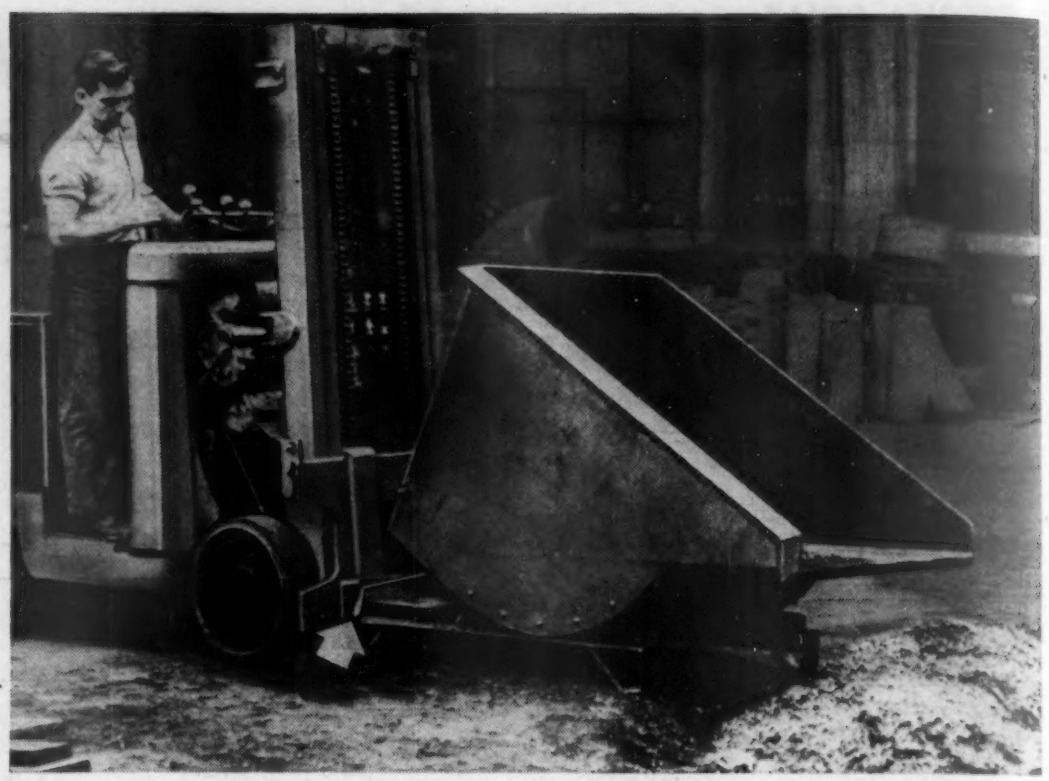
A small tank-type device that feeds a rust-inhibiting chemical into the hot water supply has solved the problem of muddy hot water in an old building where hot water tank and lines otherwise would have to be replaced. The chemical is tasteless, odorless, safe for human consumption, and dissolves so slowly—at the rate of 25 per cent per month—that the only attention required is that of filling the feeder each month with one quarter of the amount of chemical originally in it.



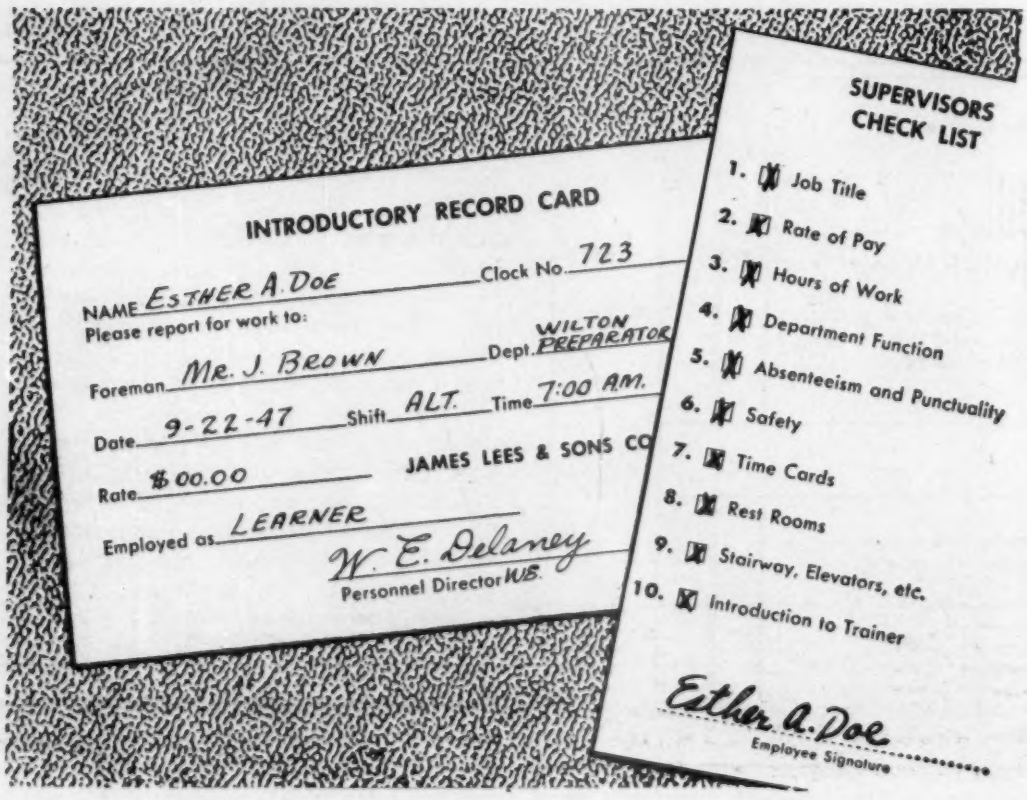
Rockered dump bin, attached to skid, is moved to scrap dump at The Union Switch and Signal Company, Swissvale, Pa., by storage-battery-powered fork truck. By tripping catch (shown at lower rear of skid), bin automatically dumps contents. When empty, it returns to its normal upright position

DISPLAY TRUCKS IMPROVE WORK QUALITY

In an effort to bring home to workers the importance of their individual jobs in maintaining the quality of the product, Century Electric Company, St. Louis, has had two display trucks made up. One shows the parts used to construct fractional-horsepower motors; the other, parts required in motors of 1 horsepower or larger.

The trucks were sent to each department for inspection by the workers. The foreman in each department was charged with responsibility of explaining how the parts made in that department fitted into the construction of the whole motor, and why it is necessary that each worker be "quality conscious."

Good results have been reported. Quality has been improved, workers are more interested in their jobs, and rework cost has been reduced.



CHECKLIST ASSURES NEW EMPLOYEE TRAINING

W. E. DELANEY, Personnel Manager, James Lees & Sons Company, Glasgow, Va.

Illustrated here are both sides of an introductory record card used at Lees' Glasgow plant to make sure that every new employee has been properly indoctrinated. Some of the items on the checklist are explained to the new worker by a training department representative. Others are the responsibility of the shift foreman.

Each new employee is given a card at the time of hiring. This is turned over to the shift foreman when the employee reports for work on the second day. As the new employee progresses during his job instruction training, the foreman makes sure all items have been fully explained. Several weeks are allowed him to do this.

After all items are checked, the employee is asked to sign the form, which then is returned by the foreman to the training department.

LOOKING AHEAD IN LABOR

Last-minute round-up as we go to press

Walter Reuther's dramatic rout of Communist-backed majority opposition in United Auto Workers is of major significance on more than one front.

Politically, it cuts ground from under Henry Wallace's third-party hopes. With Philip Murray's Steel Workers and the UAW-CIO against him, Wallace can't look for much CIO help. *So Truman stock rises.*

In the CIO itself, balance of power in the "Big Three" has swung far right, assuming "right" to mean anti-Communist. (All of labor is "left" in relation to management.)

With Steel and Auto on the right, the left-wing Electrical Workers lose influence in CIO strategy. On this left side with UE are the smaller unions — smelter, fur, longshore, food, and furniture workers. On the right — auto, steel, clothing, textile, shipbuilders. All big.

This situation, with Taft-Hartley affidavit rules, will generate more opposition to Communist influence among rank and file. Employers dealing with left-wing outfits may see some new faces on other side of the table.

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What does this trend mean to management? More union responsibility, better discipline? Not in every plant, of course. But on the whole, that will happen. In this regard, the new labor law should get most credit.

Next to Murray, Reuther is today the strongest figure in CIO. Like Murray, he's a stickler for discipline. At General Motors, Reuther kept wartime strikes to one-sixth the average for the automotive industry. *Yet GM's 113-day strike in 1945-46 attests to his determination to fight for what he thinks is right, no matter the cost.*

To some observers, UAW-CIO has just gone through growing pains. Struggle for control is over. It will now settle down, become orderly, give employers peace, if not happiness. So some observers think.

Others think differently. They say Reuther must now deliver on his promises. Employer-financed social security, guaranteed work week, uniform wage rates, "adequate" pensions, industry-wide bargaining, and more.

Further, they see Reuther injecting himself in all negotiations, firing new economic ideas at all automobile management, not GM alone. Emil Mazey, for instance, is a socialist and hell-raiser from 'way back. He's new secretary-treasurer, successor to veteran George Addes.

Here's labor legislation outlook for 1948:

1. Taft-Hartley Law: No change.

2. Wage-Hour Law: Congress will raise minimum, but will also make other changes opposed by labor leaders and the administration. Truman might veto, depending on extent of weakening amendments.

3. Wage Controls: No chance.

Headline stuff will come from Hartley's labor committee in House, but no laws. Hartley plans hearings with view toward passing separate laws (1) protecting right to work by banning mass picketing and (2) making unions subject to anti-trust curbs. Both were cut out of original Hartley Bill last spring.

If Petrillo bans on recordings and network broadcasts go into effect, Hartley will hale him before committee as leading example of need for anti-trust curbs on unions.

Meanwhile, Ball's Senate-House joint committee on labor relations will hold hearings, make studies, report on March 15. *It will not recommend Taft-Hartley changes. Not next year.*

Changes in new labor law won't come before 1949. By that time, country will have 18 months' experience with it. And some court decisions. Also, a new Congress. Trend and nature of changes will depend on many factors, chief ones being how the law works and the complexion of Congress.

CIO's PAC and AFL's LEPL (Labor's Educational and Political League) will spend millions to help elect to Congress members favoring repeal of T-H Law, even though law bars union political contributions or expenditures. Court tests may come too late to have much effect on next year's campaign.

Labor's newest political wrinkle is in a fancy necktie selling for a dollar. It shows a chained worker under the slogan: "Repeal Taft-Hartley Law."

Movies also figure in labor's political plans. Already, Los Angeles CIO is making available a film, "People's Program," claimed to dramatize "Labor's Fight" against the T-H Law.

How workers vote under new law:

On decertification: Five polls held in October, union surviving only one. It was an independent. One CIO, three AFL unions lost contracts.

On union shop: In 30 out of 31 cases, vote favored it.

On representation: Unions won 42, lost 14 elections.

Third wage-round teasers: CIO gets 12½ cents boost from men's clothing industry. Reuther says 12 per cent price rollback needed to stop third round. Textile workers get 9 per cent, part of it second round. Machinists ask 18 per cent from airlines to restore 1942 "purchasing power" in weekly take-home pay.

LOOKING AHEAD IN BUSINESS

Last-minute round-up as we go to press

Time was when it was axiomatic that you couldn't have good business without a booming stock market. But the stock market has given this business boom a vote of "no confidence."

Stocks turned down in September, 1946, just when business activity was hitting its stride. Since then stocks have been in the doldrums. For more than a year the verdict of the market has been that the boom won't last.

Now, however, stock prices have pushed up toward a new high for the year as traders take another look at business prospects. What they decide, will provide an important clue to the general business outlook.

A steady rise in stock prices would mean that the stock market was betting on several more years of good business. That would make it easier for business to raise the money it needs for new plant and equipment.

But if stock prices slip back into the doldrums, traders will be doubling their bets on a business slump soon. They may be just as wrong now as they have been for the past year. But another "no confidence" vote by the stock market would make many a businessman pause and take another look at his own business forecast.

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Meanwhile, industrial production is still on the upgrade. The Federal Reserve index hit 185 (1935-39 = 100) in September. That's 3 points above August, only 5 points below the post-war peak reached last March.

The upturn in production this fall brought unemployment to the lowest level since the wartime era of manpower shortages. The mid-October Census survey turned up only 1,700,000 workers without jobs.

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The inventory boom, counted out in July, is going strong again. Total business inventories jumped from $38.5 billion in July to over $40 billion in September. And the steady growth in bank loans to business since then means inventories are still rising.

Part of the increase is due to higher prices. Another part represents the usual stocking up for Christmas. Half the September increase was in retail inventories.

What worries business analysts, however, is that these two things don't justify such an increase. Some businessmen are overstocking to cash in on rising prices.

How serious the inventory boom will be, depends on what happens to retail sales. Department store sales in mid-November ran 14 per cent above a year ago. So there's a good chance stores will be able to move most of their stocks and avoid unusual inventory losses.

Boom in retail sales in face of higher food prices means public is saving less. Surveys show that many families are dipping into past savings, or borrowing, to make both ends meet. And a Federal Reserve survey, taken in July before the latest price rise started, showed that many families were cutting down on other things to pay grocery bills. *All in all, it's clear that the foundation of the retail sales boom is far from healthy.*

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Prices, including food prices, now rest on a new plateau. Despite all the hullabaloo about inflation and the high cost of living, wholesale prices have stabilized at a level only 5 per cent above July. And the cost of living hasn't gone up that much.

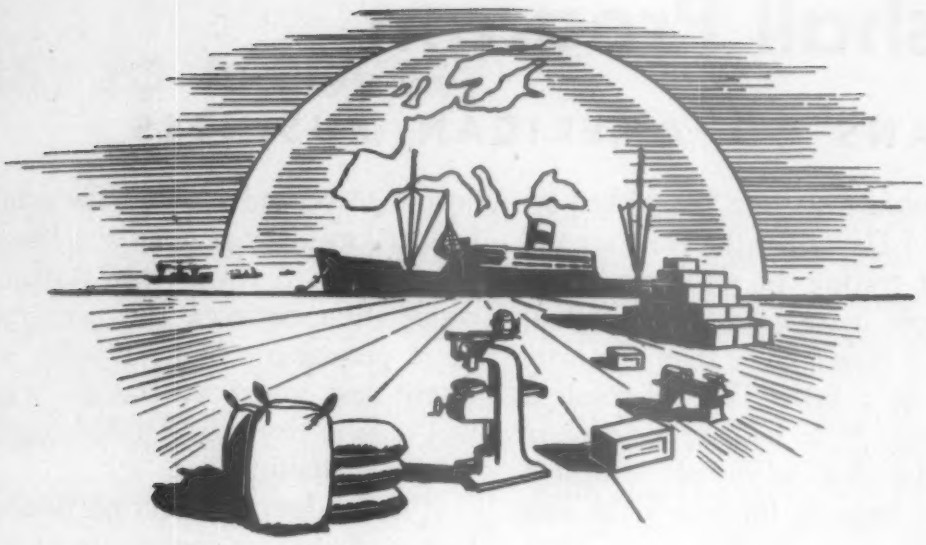
The outlook is for prices to stay on this plateau until spring. The current level of prices has been fully adjusted for the effects of the short corn crop and of Marshall Plan exports.

Part of the answer to what will happen in the spring is, quite literally, in the lap of the gods. The winter wheat crop got off to a bad start for lack of rain. Barring a near-miracle, our wheat supplies will be off a quarter to a third next year. If next year's corn crop is also short, and if there's another European crop failure, food supplies will be substantially lower than they are now. Nothing definite can be said about these possibilities before the spring crop reports are in. So prices will mark time until the crop outlook clears.

Meanwhile, the smart money is betting on a third round of wage boosts — up to 12¢ an hour in the big industries that set the pattern. This will boost industrial prices, give people more money to spend on food. So food prices are sure to go up next spring even with good crops. If crops are poor, food prices will really soar.

Will another turn of the wage-price spiral send us into an economic tailspin? Paradoxically, it's far from obvious that it will. *For one thing, industrial prices may not go up as much as wages; a FACTORY survey in September showed manufacturers look for an average rise of 7½ per cent in productivity in the next year.*

Even more important is the fact that the post-war economy is amazingly resilient. All the evidence points to the fact that it is possible to absorb another round of wage and price boosts without upsetting the applecart in 1948. But it is still true that another turn of the wage-price spiral will be unhealthy. It hastens the day when the post-war boom finally peters out.



The Marshall Program

WHAT WILL THE MARSHALL PROGRAM mean to American business? What industries will be called upon to meet the needs, and how great are they likely to be? Will the program carry with it another dose of inflation? Are new bottlenecks being created, or will old ones gain a new lease on life? Where are material shortages likely to fall most heavily?

These and a hundred other questions are in the minds of many American businessmen today. Unfortunately, no final or precise answer can be given to some of them. And it is in the nature of the problem which the Marshall program tackles — that of getting Western Europe on a steady economic foundation — that no precise answers are going to be possible. We have only to view the bad breaks Europe has collected since V-J Day, including the blizzards and drought of this past year, to see how the economic picture can change on short notice.

Nonetheless, the broad dimensions of a Marshall program are sufficiently clear to permit more than a guess about its impact on American business. Both here and abroad committees have been busy for months shaping up Western Europe's rehabilitation needs. At the same time a mine of information has been pulled together about our own output and capacity. The result is a small library of technical reports which carry most of the facts Congress needs for a decision on the immediate problem.

McGraw-Hill's Department of Economics has waded through these reports and queried industry itself to determine the likely effect of the Marshall program on American business. This report carries the main results of their investigation.

One conclusion emerges clear-cut. American business can not provide the assistance Western Europe will need without considerable cost to itself. Such costs are outweighed by the gains that can be expected, economic and social, as well as political. Nevertheless, business will want to anticipate those difficulties that might arise and move to overcome them. The following pages, therefore, highlight both the problems and the benefits that are likely to fall to American business as a result of the Marshall program.

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The Marshall Program

WHAT IT MEANS TO AMERICAN BUSINESS

WESTERN EUROPE'S INDUSTRIAL MACHINE has picked up considerable speed since V-J Day. But vital gears are not meshing and industry isn't getting the job done that is necessary. The things people most need are those that are lacking. Food output is down more than a fourth. Coal production is lower by a fifth. The net result is a living standard that ranges from bare subsistence in some countries to a level far short of prewar in others. And even this depends on imports for which the area can't pay.

This melancholy economic picture has its political counterpart. The best organized and the most energetic political party in France and Italy is Communist. While the Communists in Germany and Austria are less strong, they still are an element to be reckoned with. These are all key areas which, should they fall within the orbit of an unfriendly power, could well destroy the freedom of political action throughout all of Western Europe.

Needless to say, such a development would have military implications of the utmost importance. It is a military axiom that any defense must be organized in depth. And in the event of any emergency "depth" for the United States must now include Western Europe.

It is this complex mixture of the economic, political, and military, then, that has led to the Marshall program. Underlying this program is a deep conviction: That Western Europe possesses the skills and resources necessary to work out its own economic salvation. The fact that in two years it has not done so reflects both the depth of the wounds it suffered in war and the bad breaks it has received since then. With time these skills and resources can reassert themselves. Meanwhile, food, equipment, and materials from America will shorten the job and enable Western Europe to stay on its feet.

Western Europe's Program

SECRETARY MARSHALL gave the program that bears his name its initial push. But it is Western Europe which quickly seized the initiative. A committee of 16 nations met and surveyed their needs and resources. From this survey grew a broad program designed to achieve a balance between the economies of Western Europe and the rest of the world by 1952. Moreover, the program seeks such a balance while raising the standard of living close to that of pre-war days. Hunger and disorder which force extreme social change might thus be eliminated.

As developed thus far Western Europe's economic program is not a detailed plan of action. It does, however, lay out the terrain that must be covered if its objectives are to be reached. Four fields are staked out for action. One involves an immense effort on the part of the cooperating nations to raise their own capacity and output. A second requires the establishment of internal financial stability in countries like France and Italy that now lack it. A third looks forward to closer economic cooperation between the participating countries on a more permanent basis. Finally, a fourth lays out the extent and nature of the aid which Western Europe will require from the United States and the rest of the Western Hemisphere.

It is this fourth aspect of Western Europe's program that is of primary concern to us here. Nevertheless, the hard core of the Marshall Plan is that aid alone can not solve Europe's problem. And it is no exaggeration to say that the most important features of any program are those which Europe itself must fulfill. In this regard, nothing is more critical than the goals set for an expanded capacity and production.

THE PRODUCTION GOALS

Europe's production goals also have an importance for American business. They suggest lines in which Europe eventually will become independent of the United States, as well as competitive in world markets. Here are some of their highlights:

a) An increase of steel ingot production to 61 million tons, a fifth higher than 1938.
b) Development of oil refining capacity to 2½ times pre-war (largely for refining imported crude).
c) Increase of coal output to 644 million tons (U.S. output in 1947 is around 600 million tons).
d) Rapid advance in the output of electrical products —needed in part to help equip a 25 million kw expansion of generating capacity.
e) A large increase in capacity of other key equipment industries; e.g., mine equipment, petroleum equipment, farm machinery, construction equipment.
f) Restoration of pre-war output of bread grains and cereals; expansion in sugar, potatoes, fats and oils.
g) Restoration of merchant fleets to pre-war size.

These are very ambitious goals. They call for a great advance from the current position, as the chart on the next text page shows. In some aspects (electricity, foodstuffs, perhaps coal, are examples) they appear unlikely to be met, at least by 1952. Such a development would, of course, modify the import list.

THE IMPORT REQUIREMENTS

To do the job that confronts it Western Europe has said it needs more than $20.5 billion of goods and services from this country over a period of four years. In return it would plan to offer us goods and services to the value of $4.7 billion. That leaves a whopping deficit of about $16 billion. The heaviest commodity export ($6 billion) – and the biggest chunk of the deficit – would arise next year. Thereafter, exports would fall off about

(Continued on page after next)

Coal: KEY TO RECOVERY

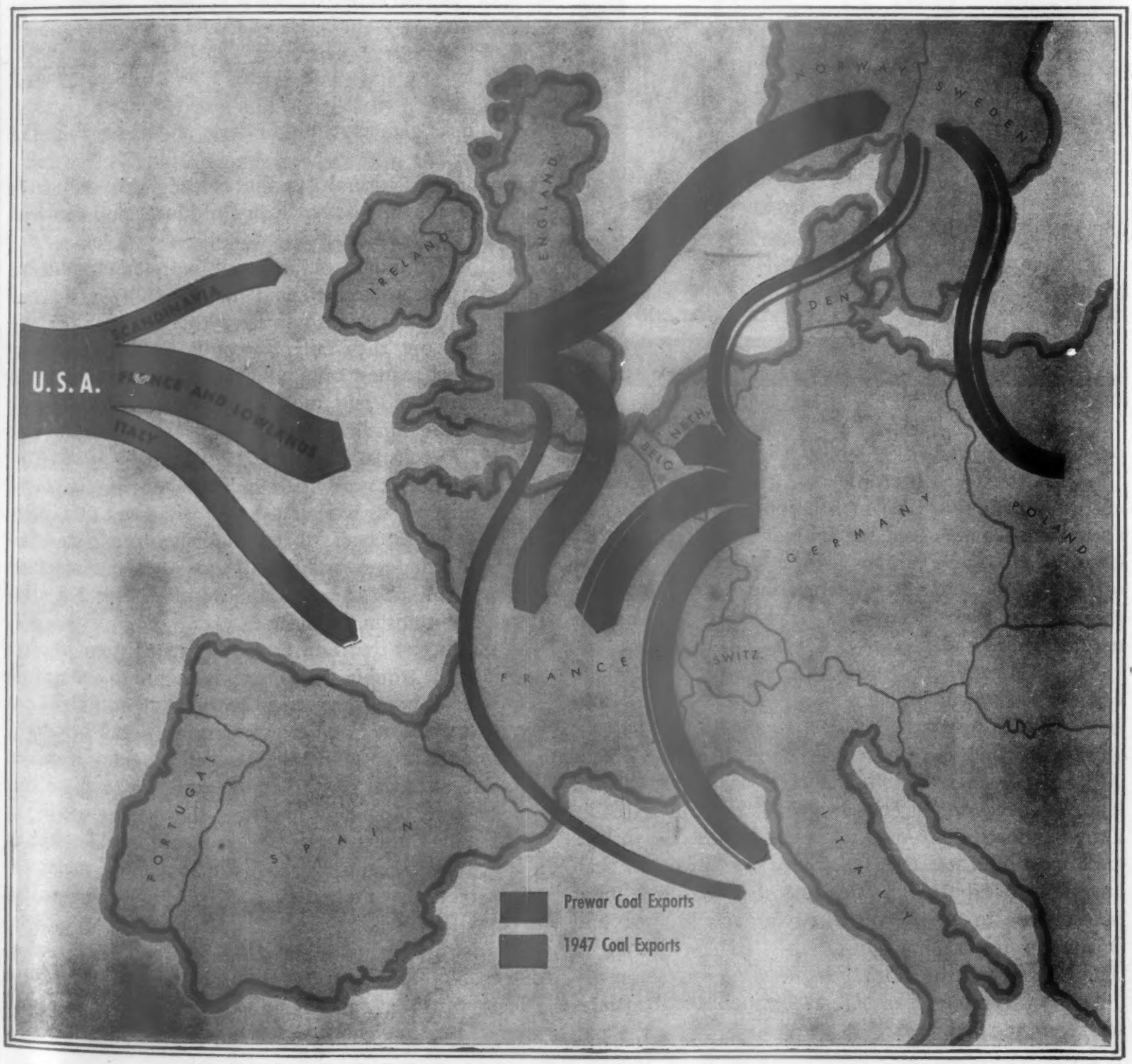
COAL IS AT THE HEART of what is wrong with European industry today. Because of the lack of coal, factories run part time, fields are less fertile, and firesides are cold.

What Western Europe plans to do about coal is typical of what it plans to do about industry generally. The job is to expand output in its own producing centers, resume exports within the region, and cut down costly and unnecessary imports from the United States.

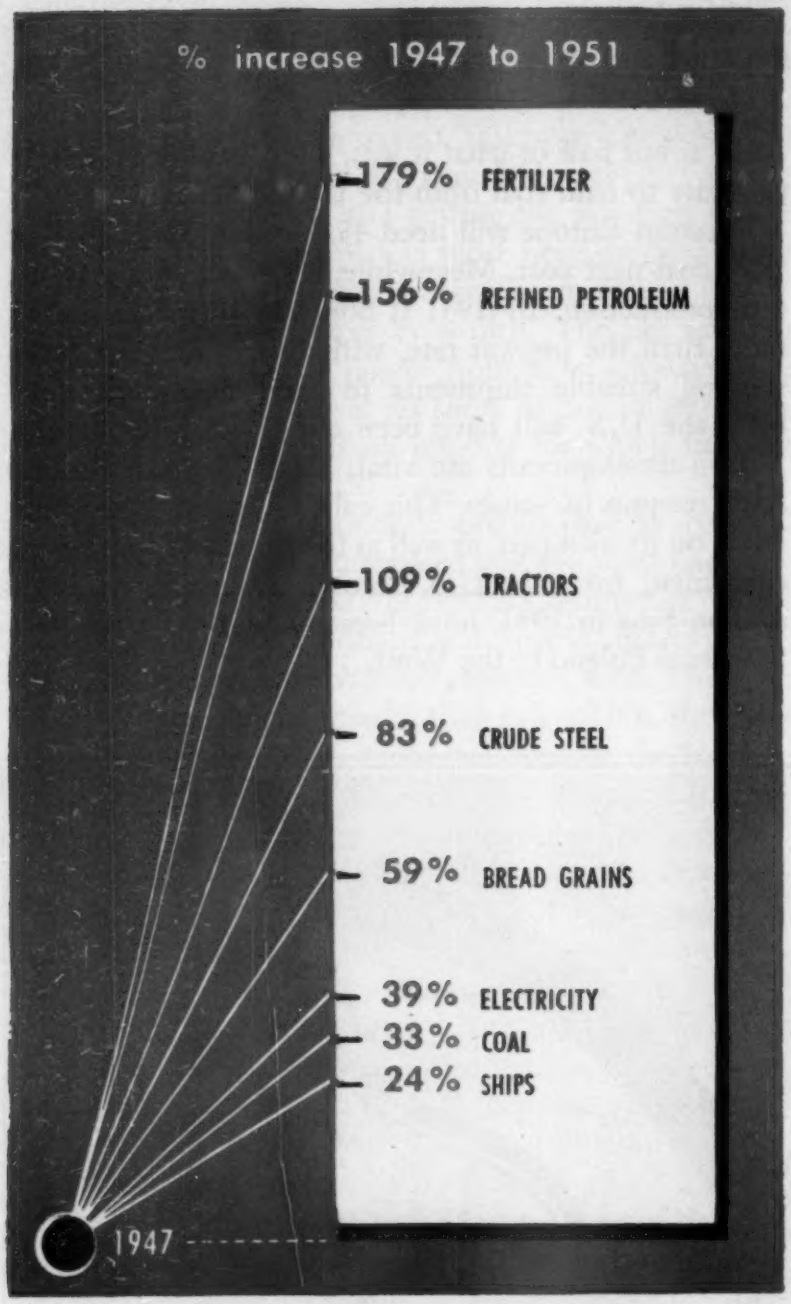
In the case of coal this means restoring a flow which in pre-war days was the life-blood of Europe's industry. As the map shows, two great coal centers – Britain and Germany – supplied not only their own nationals but the needs of other countries as well. Today Britain can't meet its own requirements and coal production in the Ruhr is but half of what it was. The result is the costly necessity to haul coal from the United States.

Western Europe will need 45.2 million short tons of U.S. coal next year. Meanwhile, it plans to build up its own production. By 1951 it hopes to turn out coal at more than the pre-war rate, with Britain and the Ruhr sending sizeable shipments to their neighbors. Coal from the U.S. will have been cut to 6.6 million tons.

Two developments are vital. First, Western Europe must reequip its mines. This calls for a vast production effort on its own part, as well as the import of specialized equipment from the U.S. Second, a river of coal, 34.2 million tons in 1951, must breach the iron curtain and flow from Poland to the West.



Western Europe's Production Goals



one-third to a total of $4.1 billion in 1951.

Nor is the U. S. the only base from which Europe needs vital supplies for which it can't pay. Canada and Latin America are asked to shoulder a trade deficit that comes to almost $6 billions for the four years. Needless to say, if food and raw materials are not available on credit from these areas, the larger will be the sum required from the U. S.

There already is considerable debate about these figures. There will be a lot more while Congress considers the aid program. The fact is, and this is the conclusion at which the President's Committee on Foreign Aid arrived, no final estimate of how much Western Europe's needs might cost over four years can be made. Crops, industrial production, prices, trade relationships and a host of other factors may turn out differently than anyone now expects. For this reason the United States may choose to review Western Europe's progress and its import needs on a yearly basis, rather than fix in detail a four year program. For the same reason our discussion of Western Europe's requirements concentrates largely on the picture in 1948.

As it now stands, the list of items that Europe wants to get from us is more general than specific. Moreover, inter-departmental committees have taken the list and pared it down, chiefly on grounds the supplies are not available. Here is the way the general categories shape up, both as initially requested and as revised. The figures represent total imports and are in millions of dollars.

	European Committee Estimate for 1948	Estimate for 1948 as revised	European Committee Estimate 1948-52
Food, Feed, and Fertilizer....	1,500	1,270	5,400
Cotton	400	350	2,000
Coal	340	370	700
Iron and Steel Products.....	370	230	1,200
Petroleum Products	510	485	2,200
Chemicals	250	200	850
Timber	100	95	400
Farm Machinery	370	100	1,100
Inland Transport Equipment..	200	60	490
Petroleum Equipment	170	130	555
Mining Machinery	80	80	220
Electrical Equipment	150	125	500
Machine Tools and other Machinery	545	450	1,750
Miscellaneous	1,065	1,065	3,030
	6,050	5,010	20,395

A quick glance behind these totals reveals the following:

Among agricultural supplies breadgrains and feedstuffs are the big items. Dairy products and fats and oils are also sizeable.

Of the $2 billion or more of petroleum products, three-fourths are refined and one-fourth is crude.

Coal shipments will bulk large the first year (45 million tons) but they fall off rapidly thereafter.

The steel request originally included 1.5 million tons of scrap in 1948 and more thereafter. This isn't available. Of the finished items, sheet and tin plate come to 744,000 tons in 1948, the peak year.

The chemicals wanted are industrial chemicals, paints, and medicinals as well as a lot of unnamed specialties.

The huge catch-all labeled miscellaneous covers textiles and whatever additional consumer manufactures Europe will seek. Aircraft and surplus ships are other important items in the group.

A number of items on the equipment list could cause considerable trouble. Farm machinery, mine equipment, refining equipment, electrical apparatus, and freight cars are among these. Each is examined in detail below.

These exports under the Marshall program, if carried out, will affect all of U. S. business down to the corner grocery store. In many instances the impact will be so slight and indirect as to be hardly noticeable. But in a few industries the program will loom as a major element, dictating production patterns and setting a limit to capital expansion plans.

It's hard to paint a simple picture of a situation so diverse as this. We try to do so below by dividing the effects of the Marshall program into several broad groups. First we consider the impact of the program on

the general level of business. Next, we cover the impact on leading industries – steel, oil, electrical equipment, farm machinery, and the like – and the effect on business through the creation of shortages in these items. Finally, we examine the influence of the program on farm prices and living costs.

THE OVER-ALL LOOK

The Marshall program comes at a time when certain demands contributing great inflationary pressure on business are beginning to slacken. While it will help hold business at a high level, the program itself is not great enough to maintain a general inflationary pressure. Nevertheless, it will give new strength to shortages that have been troublesome to business. In these latter areas, as well as on the food front, prices will continue firm and may go even higher.

If the program is carried out along lines described above exports to Europe will run about $5 billion. The gain here will offset a decline that has already begun in U.S. exports to other areas. After a careful study of these divergent trends, we conclude the end result is likely to be a total export of goods at a rate of about $15 billion in 1948. However, this rate will only be reached after the program starts rolling. The sale of services – shipping, tourist and the like – will add another $2.5 billion to our foreign account. Moreover, this over-all sum of $17.5 billion probably will run about $9 or $10 billion greater than our imports.

Under the Marshall program, then, our foreign trade in 1948 will be carried toward the peak that prevailed in second-quarter 1947. But the over-all inflationary impact of exports in 1948 is bound to be less than it was in second quarter 1947. Not only is our capacity to produce growing, but certain elements in our domestic demand are almost certain to be less strong next year.

This last fact is important and needs to be spelled out. Indeed, it's impossible to determine the effects of the Marshall program without some idea of what would happen to business without it. The accompanying chart which shows how our gross product has been split up in the past several years serves as the starting point for such an estimate. There it can be seen that the spending of domestic consumers takes the biggest slice of the gross product ($164 billion). However, the share going to business and to government also has been sizeable (about $30 billion each). Alongside each of these the net expenditure of foreigners on our goods seems small. Nevertheless, it has a tremendous importance to a huge number of business firms and industries.

Left by themselves, the spending of consumers and of government would be likely to fall very little if at all next year. But business outlays – spending on plant, equipment, inventories, and residential housing – are another matter. Here the vulnerable items are plant and equipment. Capital expansion has been extraordinarily large for two years, and in not a few cases business is completing its initial post-war program of capacity expansion. Therefore, some decline, but not a large one, is expected in the aggregate of business spending during 1948. This in turn would have some reaction – but again a minor one – on the spending of consumers.

The net effect of such developments should be to place industry in a better position to meet the pressing needs of the Marshall program. This does not mean, however, that the program can be handled without difficulty. The trouble is that many of the items Western Europe most needs are those which would, under normal conditions, continue in tight supply. It is these bottlenecks that business will want to anticipate and, to the extent possible, overcome. Here are the facts concerning the most important of them.

COAL: TRANSPORT IS THE DIFFICULTY

Western Europe wants 45 million tons of coal from the U.S. in 1948. Thereafter requirements drop sharply to 6½ million tons in 1951.

U.S. production of bituminous next year ought to equal the 600 million tons turned out in 1947. If it does we can meet Europe's need. However, the job will call for careful scheduling of delivery. For the real problem in coal is a shortage of coal cars. This has plagued industrial consumers in 1947. Unless car turn-around times are improved (they now average 14 days as against 11 during the war) car shortages will continue through 1948. Under such circumstances, exports to Europe won't permit the accumulation of normal stockpiles – a fact managements in many industries won't like.

Any actual shortage in production that might develop will be limited to special types of coal – particularly the better grades of coking and by-product coal. Europe has concentrated largely on these. Such concentration isn't necessary, but since transport costs (the big element for Europe) are about the same for all grades, Europe has

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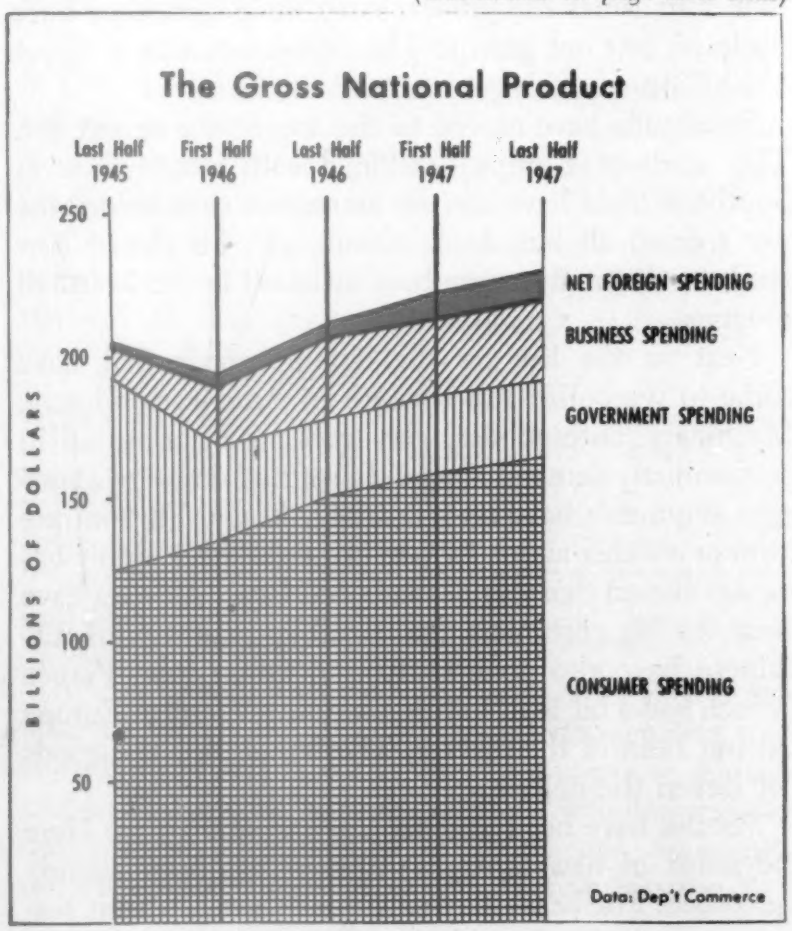
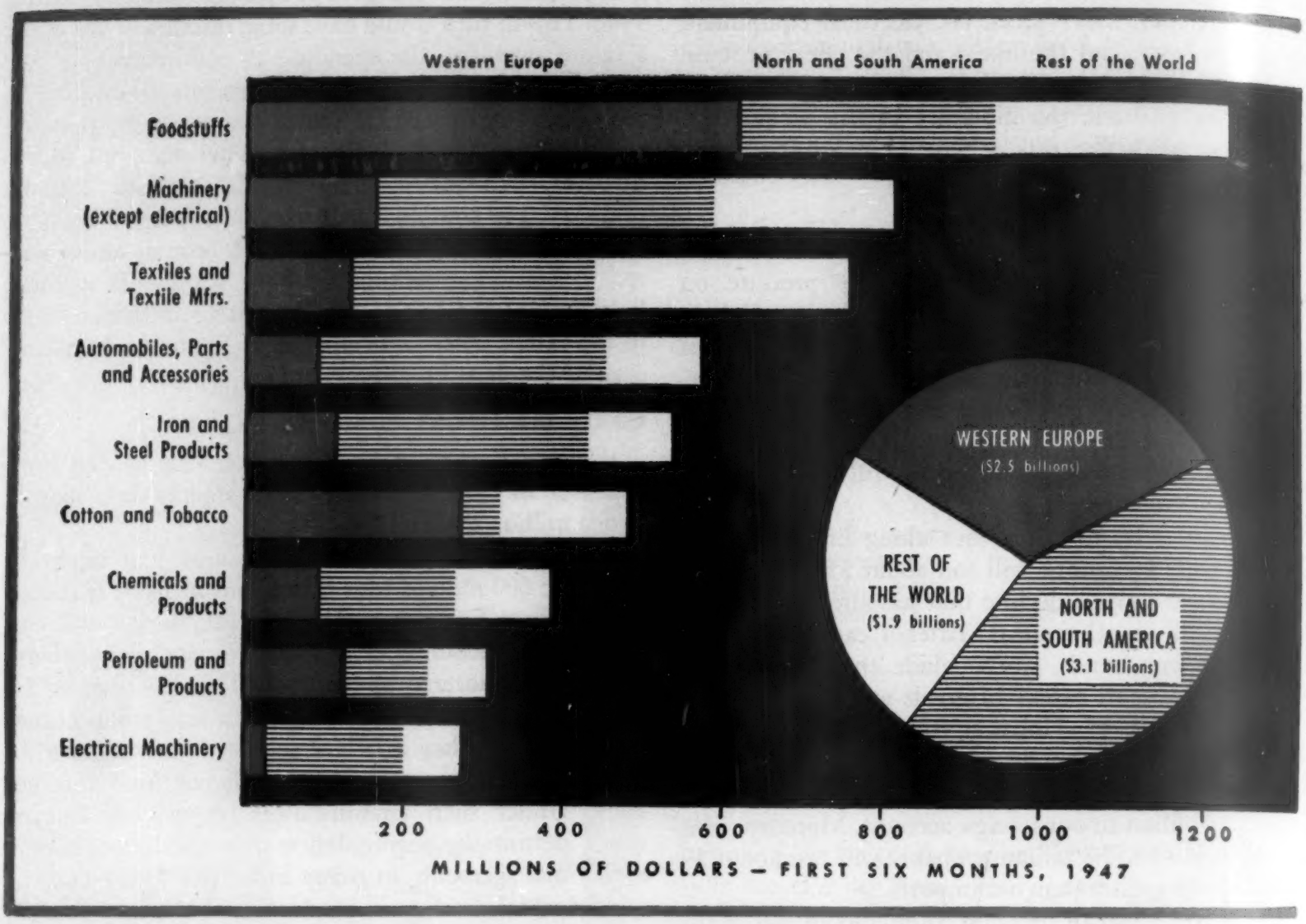




U. S. EXPORTS . . . Where they go — What they are

U. S. EXPORTS THIS YEAR hit an all time high. Shipments in the first six months were at an annual rate of $15 billion, four times the pre-war rate. Since then they have declined, but not greatly. The export rate now is about $13 billion.

Foodstuffs have moved to the top of the export list. The needs of Europe combined with crop failure in Southeast Asia have revived an export that before the war seemed all but dead. About half this record flow has been directed to countries included in the Marshall program.

Next on the list are the durable goods that have come to symbolize the strength of American industry. Machinery, automobiles, and steel products are all in extraordinary demand abroad. In spite of domestic shortages, shipments have been relatively heavy. Thus in one form or another about 18% of our tight steel supply has moved abroad this year. Canada and Latin America have been the big customers, and sizeable quantities of machinery have also gone to Russia. Other than France (which had a big loan for the purpose) Western Europe has not been in the market. They've needed the goods but lacked the dollars.

Textiles have been another huge export group. Here the influx of new foreign customers has been warmly welcomed. For heavy buying from abroad has kept textile output going at a good pace.

Cotton, tobacco, oil, and chemicals are other supplies that bulk large in U.S. trade. Western Europe has been a principal buyer of all except chemicals. Canada and Latin America again have been at the head of the line for these last items.

Regardless of the Marshall Program, some shift in U.S. export trade could be expected in 1948. The recent splurge of foreign buying cannot be maintained if for no other reason than that funds will not be available. U.S. import of goods and services — the chief source of dollars for most of the world — has been only 40% of exports. About $10 billion of loans and relief grants helped keep Europe in the market. At the same time, foreign nations drew down dollar balances and shipped gold.

Net effect of the Marshall program on exports is to provide $4 to $5 billion of trade that otherwise is lacking. Not all this added trade need be with Europe. If the U.S. provides dollars for Western Europe to buy in Latin America and Canada—which it well might—those areas will spend more here. Nevertheless, under the Marshall program much more of our trade will be directed toward Western Europe and the things it wants. These are foodstuffs, industrial supplies, and machinery. Little in the way of textiles or automotive equipment is on Western Europe's shopping list.

sought the best. U. S. utilities, steel and gas manufacturers, and the Great Lakes trade are large domestic users of these fuels. They will continue to feel competitive pressure unless Europe's buying habits are changed.

PETROLEUM — WORLD-WIDE SHORTAGE

Regardless of whether the U. S. provides the full amount of petroleum Western Europe has asked for, industry and households may have to go slower on switching to fuel oil than they desire. Oil already is in tight supply in America, and this reflects a shortage that is world wide. The cause of this shortage lies not only in refining and production bottlenecks. Perhaps even more important is the lack of sufficient transport capacity, particularly pipe-line and tank car. With steel (including pipe and tubes) as it is and will be, this tight oil situation can't take a quick turn for the better.

Europe wants to build up its imports of crude and do a steadily larger amount of processing on its home grounds. Here is the way dollar imports of the two broad groups were initially scheduled by the European Committee at Paris (figures are millions of tons).

	Imports of Crude	Imports of Refined Products
1947	6.1	17.0
1948	8.5	17.7
1949	10.2	19.0
1950	12.6	18.2
1951	18.8	13.7

These requirements are not likely to be met in full during 1948. However, we should at least match and perhaps slightly better the export of 1947. In 1949 the situation should be somewhat easier. But no one will be surprised if refinery construction in Europe lags and more refined products are needed than plans call for.

The European Committee was careful to say these imports were from "dollar areas." That means they are supplied by American companies (who need payment in dollars), but not necessarily from the United States. As a matter of fact, almost 60% of Europe's oil in 1946 came from the Caribbean and the Middle East, as against 20% from the U. S. proper. American companies furnish much of this foreign oil and any increase in exports probably will flow from foreign supplies.

All this is not to say that the export of oil from the U. S. proper is not considerable. It is, with exports this year running at a rate of more than $600 million. About $250 million of this—chiefly refined products—has gone to Europe. From the standpoint of refining capacity alone, shipments of refined products from the U. S. could, in a pinch, be stepped up slightly. But capacity also should be available in the Caribbean and the Middle East. It makes economic sense to ship from these other areas and they should get the business.

CHEMICALS AND FERTILIZER

Nitrogen fertilizer is the one U. S. chemical product high on Western Europe's priority list. Industrial chemicals and pharmaceuticals are wanted, but are not likely to be purchased in quantity if funds run low.

Nitrogen, of course, is in extremely short supply the world over. Moreover, this shortage probably will not be licked until the early Fifties. If Western Europe were to receive the full 319,700 tons of nitrogen it desires from the Western Hemisphere in 1948, consumption in the U. S. would of necessity be reduced. Not only would commercial exports have to be increased, U. S. imports would also decline. Large supplies (180,000 tons) from Canada and Latin America make the U. S. a net importer on commercial account.

The likelihood is that Western Europe will get more nitrogen next year than this. However, the advance will come out of a small expansion of production, leaving U. S. consumption what it was. From the U. S. some 70,000 tons (6½% of production) may be shipped. This would equal commercial exports to all areas in 1947.

The U. S. also will provide phosphates to Western Europe – perhaps 80 to 85,000 tons. However, production should be adequate to carry this with little trouble.

Among other chemical products, Western Europe would like the following (figures are millions of dollars).

	1948	1948-51
Industrial Chemicals	50	190
Paints and Pigments	40	145
Coal Tar products, Medicinals, etc.	160	515
	250	850

No forecast of our actual export of these products is possible. However, shipments are likely to run considerably lower than the above figures suggest. Western European production can fill the most essential needs. Since supplies here are very tight on many items, exports to Europe may not greatly exceed those of 1947.

STEEL — STILL THE NO. 1 PROBLEM

No material caused more trouble for U. S. industry in 1947 than steel. The extent of the shortage in 1948 – and the possibility that it might end – has been a key element in the plans of many producers for next year. Under such circumstances the needs of Western Europe are bound to be weighed and measured with care.

Here is what the initial report from Paris asked for in the way of steel (figures in thousands of tons).

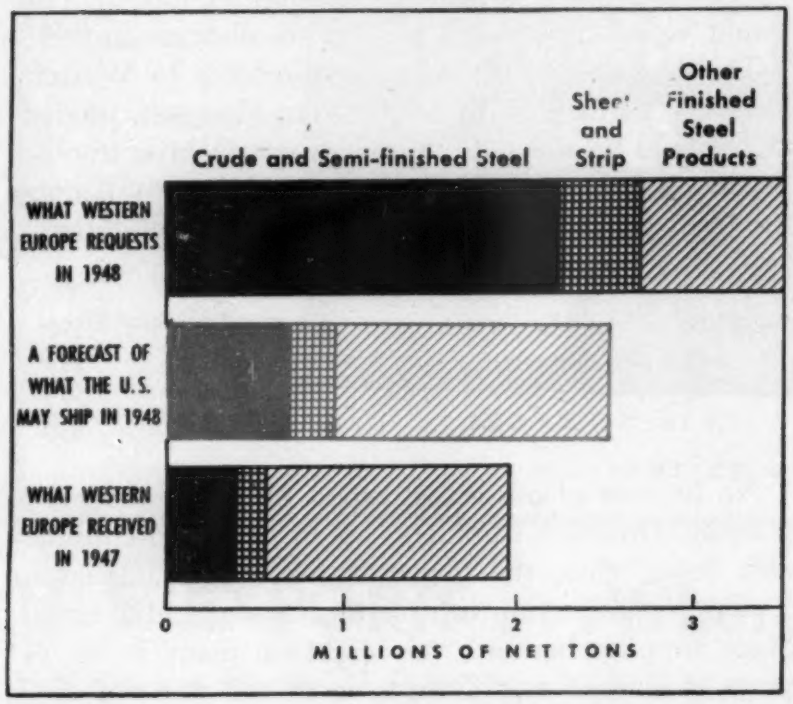
	1948	1949	1950	1951	Total
Ingots and semi-finished items	2,244	2,299	2,475	2,387	9,405
Sheet and strip	424	198	34	...	656
Tin plate	320	314	296	275	1,205
Other finished steel	500	...	...	...	500
TOTAL	3,488	2,811	2,805	2,662	11,766
Steel scrap	1,500	2,000	2,300	2,500	8,300

At first glance these requirements don't appear too hard to meet. This year we have been sending steel abroad at the rate of 6.2 million tons annually. Canada and Latin America took more than 3.5 million tons of this. Europe took only about 2 million tons. Apparently the problem could be solved by shifting exports.

Unfortunately, the answer is not as simple as this. What Western Europe wants – it's really Britain and Italy that want it – are steel ingots and other semi-finished items (billets, blooms, etc.). These the U. S. has been consuming itself. Exports have been almost entirely in the form of finished products.

From the standpoint of the steel industry, shipment of semi-finished items has two bad results. Certain finishing capacity would be made idle. As a matter of fact, the amount of semi-finished steel Western Europe wants is 40% of the supply non-integrated producers of steel products have been able to get from the integrated producers (who turn out the ingots). In addition, badly needed scrap from the finishing process would be lost.

The Dilemma in Steel



What we shall do about this hadn't been settled yet. Those of the President's Advisory Committee on Foreign Aid who specifically studied the question felt very little semi-finished steel should go abroad. This, however, would hit Western Europe hard. A likely compromise – and one suggested by the Government agencies reviewing Western Europe's requirements – would substitute finished items for semi-finished. Shipments of the latter in 1948 would be held to around 650,000 tons, less than a third of the initial request. But export of finished steel (other than sheets or tin plate) would jump to 1,150,000 tons. On one matter, however, all seem agreed. No straight scrap can be sent. The U. S. just doesn't have it.

Where does the steel consumer stand on all this? From his point of view the export of any steel makes life more difficult. No matter what is shipped he will feel it next year. Here is the probable situation under either the initial request or as it may be revised.

a) Overall the supply will remain about as tight as it has been this year. Although demand on the part of equipment producers is expected to decline somewhat, this will be offset by heavier requirements for construction, transport, and export. Late in 1948 and early in 1949, addition of 2.5 million tons of basic ingot capacity may help somewhat.

b) Steel sheets will continue to be a headache, but probably slightly less of a one than in 1947. Long awaited additions to capacity are beginning to come in. By the end of 1948 the total should stand 3 million tons higher than at mid-1947 (a gain of about 18%). Western Europe probably won't get all it has asked for. Shipments might not exceed 225,000 tons, half the initial request. And most of the increase over the export this year (164,000 tons) is likely to come out of shipments that have been going to other areas.

c) Tin plate also seems destined to remain tight. But here the trouble is as much tin as steel. Exports this year are 561,000 tons, but only a fourth has been shipped to Western Europe. If Europe's requirement of 320,000 tons is to be met, other world areas will probably bear much of the burden.

EQUIPMENT BOTTLENECKS — COAL EQUIPMENT

The equipment items are the toughest part of the Marshall program to assess accurately. The European Committee itself failed to develop any clear-cut list of what will be needed. The large sum labeled "mine equipment," for example, includes a certain amount of electrical apparatus. And no detailed breakdown whatsoever was initially presented for the broad equipment groups listed earlier. Some of these shortcomings will be rectified by information now being obtained. In the meantime, equipments lines where the added needs of Western Europe undoubtedly will cause difficulty can be earmarked.

Coal equipment is one such item. The total of $80 million which Western Europe wants in 1948 is half again as much as our export to the entire world this year. Today order backlogs run from 6 to 24 months on many types of mine equipment. Fortunately, some that are most tight – mine locomotives, coal loaders, coal cutters (except the long wall type) – apparently are not wanted by Western Europe in quantity.

Equipment that is needed quickly includes pneumatic tools, conveyor belting, and long wall cutters. These are all adaptable to European mining and can relieve bottlenecks that now exist in supply. Conveyor belting is the most difficult of these items. However, the main trouble in meeting Western Europe's coal equipment needs may arise from another direction – the supply of machinery, parts, and materials for producers of mine equipment in Britain and on the continent. Without help, European plants can't meet the production schedules set for them.

PETROLEUM EQUIPMENT

Western Europe may spend about $130 million on U. S. petroleum equipment next year. This is three-fourths of what was originally planned, but it comes close to our total export of petroleum equipment in 1947. The entire expansion program projected by Western Europe's oil industry will run to some $1.8 billion in four years, with a third for U. S. equipment.

Big items needed probably will include steel pipe and tubes, pumps of many sizes, large vessels (fractionating towers), turbo-generators, and well drilling apparatus and parts. Probably the most difficult problem here is steel tubing. Orders are now on the books for production into 1951. Very little has been exported, and what Europe gets in 1948 will clearly be at the expense of domestic consumers. Other trouble spots are pumps, turbo-generators and large vessels.

Our own petroleum industry is undertaking a record capital outlay on production and refining of about $3 billion this year and next. Part of this is in the Middle East and Western Europe itself. Therefore Western Europe's oil industry will compete with American companies for scarce equipment and supplies. Such competition is to be expected in Europe, as well as here.

Since the American program is much further advanced, Western Europe's expansion plans may well lag. This certainly is likely to be the case in the Middle East. Almost half the U. S. equipment wanted by British and French companies is for projects in that area. Many of these require the help of American engineering firms, since U. S. engineers are most familiar with recent developments in installation and design. This engineering talent is itself a scarce element in the petroleum expansion scheme. It may prove the factor that sets a slower pace than Western Europe had planned.

FREIGHT CARS — DELIVERIES LAG

Freight cars for Germany are the only import of inland transport equipment which Western Europe urgently needs from the U. S. Production within the area can take care of most other requirements.

Import requirements initially were set by the European Committee at 103,000 cars, with 89,000 needed in 1948-49. European equipment is less than half the size of ours; so in terms of U. S. freight cars this boiled down to about 20,000 cars in 1948 and 19,000 in 1949.

Freight cars, of course, are one product whose need in the United States is urgent. Car builders have more than 100,000 cars now on order. Thus far their deliveries have failed to average more than 6,000 cars a month.

The President's Committee on Foreign Aid, surveying the tough situation here and in Germany, finally recommended a shipment in 1948 of 20,000 cars (the American equivalent is 8,000). To the extent this is met, American railroads will have to accept somewhat later delivery. The number involved is not great enough, however, to make any appreciable difference in the overall freight situation. This is likely to remain about as tight in 1948 as it has been this year.

ELECTRICAL EQUIPMENT

Equipment for Europe's electrical industry may prove less troublesome than originally expected. Western Europe plans to produce all the heavy apparatus required for its vast generating plant expansion — at least for the first several years. Thereafter, U. S. producers will be in a position to help them if they need it.

The four year need for U. S. equipment originally was set at $500 million. Some $300 million of this is to be spent on items that do not include any heavy apparatus. Materials and equipment required by the electrical manufacturers themselves are on this list, although no details are given. Its exact effect on our own electrical industry can not be measured until we know more specifically what is involved.

The remaining $200 million will go for hydro equipment on projects of an international character. These may possibly be financed by the World Bank and an immediate start on the equipment is probably not necessary. U. S. electrical equipment producers certainly could not get such work well under way for several years. But certain shipbuilding firms might begin on turbine equipment if desired.

If the electric equipment story ended at this point, it wouldn't be so bad. However, the above figures don't give the full picture. Large motors, turbo generators, and other items are also required for expansion in the petroleum, coal, and steel industries. In many cases these very products have held up the completion of new capacity in this country. Even without Europe's demand they would continue tight well into 1949.

MACHINE TOOLS AND OTHER MACHINERY

Western Europe hasn't set any fixed estimate of what it might spend on machine tools, construction machinery, and other equipment. If the entire program went as initially planned, about $550 million would be available in 1948 for such products. However, the amount actually spent will probably be considerably less than this. No direct aid is likely to be given by the U. S. for the purchase of such equipment; so the countries concerned will have to use whatever funds they can scratch up themselves. How much this will be no one knows.

Machine tools are certain to bulk large on this list. Shipments to Western Europe in first-half 1947 were at an annual rate of $75 million. They should be in larger volume next year. Western Europe appears to hold a fairly adequate stock of general purpose tools. But the expansion of capacity in a number of metal working lines, if carried through, will require a large variety of special purpose tools.

Machine tool needs can be met without difficulty. However, one group of products that might cause trouble is construction equipment. This has been in great demand here. While some items are approaching an easier supply position, others like cranes and power shovels remain very tight. Western Europe has spent a modest sum on U. S. construction equipment — $16 million in the first six months of 1947 — but it would like to spend more. If it tries to do so, exports to Canada and Latin America may have to be cut.

Demand for U. S. textile machinery by Western Europe also has been relatively small — about $7 million in first-half 1947. This situation is expected to continue,

with the region producing most of what it needs itself.

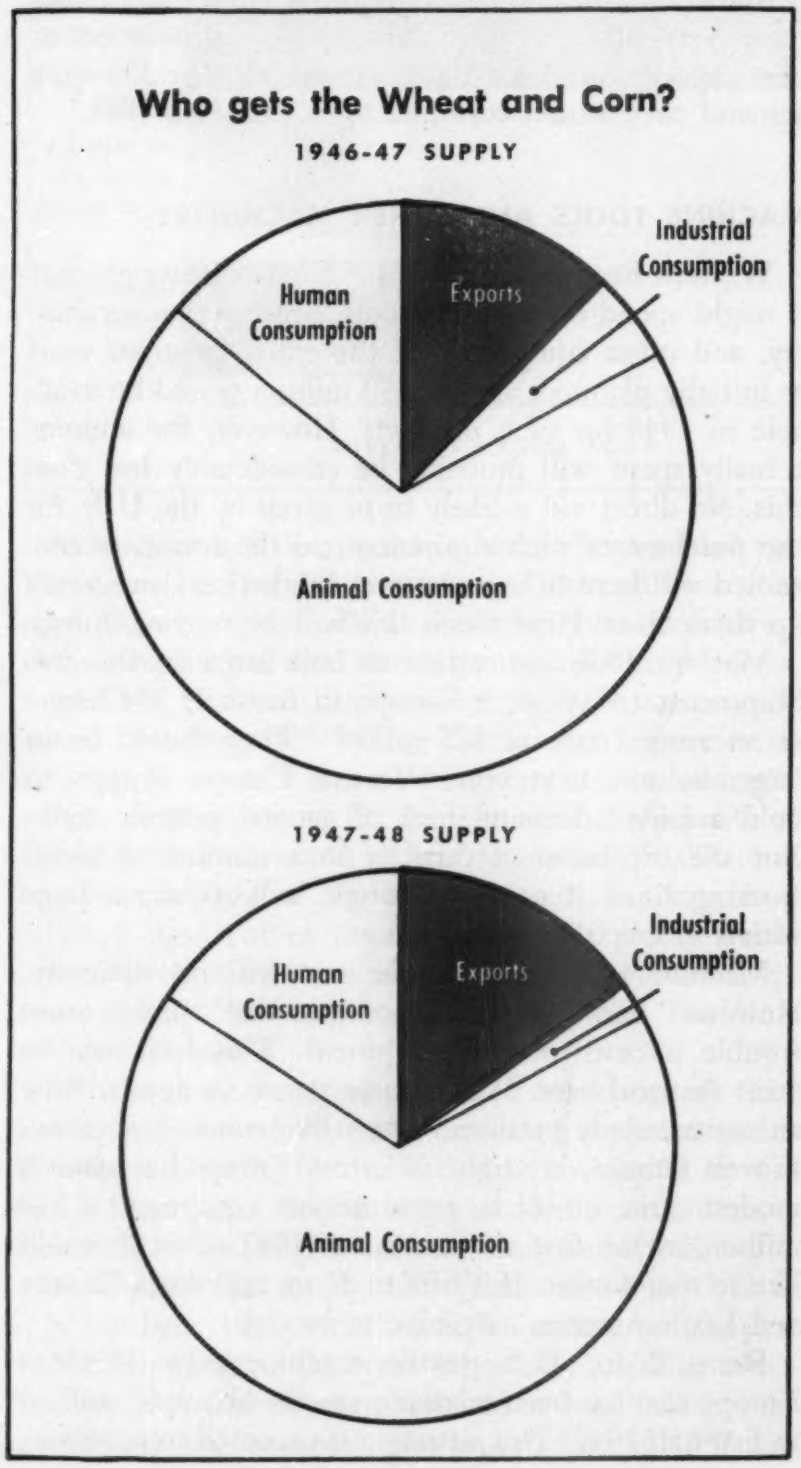
Steam engines, canning machinery, milling machinery, and a long list of other equipment items round out Western Europe's capital requirements. Most of these can be supplied without many of the difficulties reviewed above. And there is one product of great importance to America which Western Europe plans to satisfy largely from its own plants – automotive equipment, particularly passenger cars.

EQUIPMENT FOR THE FARMER

Western Europe's first request for farm equipment in the 1948-51 period was equal to our entire output of 1947. Since this amount obviously can not be spared, the request has been scaled down very substantially. In 1948 shipments are not likely to be more than $100 million, with the new four year goal something on the order of $600 million (half the initial figure).

American farmers can spare this amount of equipment in 1948, although they certainly would buy it themselves if it were not set aside for Europe. Production is likely to run to about $1.35 billion, up some 10% from 1947. But other foreign customers also will have a bid in for a part of this. Canada and Latin America, who bought some $105 million of the $175 million of farm machinery exported this year, need further equipment badly and cannot be shut off with nothing.

After meeting the European and other export demands, American farmers still should receive more new equipment than in any other year except 1947. Thus, they will continue to make considerable progress in their drive to mechanize, although the pace will be slower than they would choose. Above all, the demands of Western Europe and other countries should not be too large to interfere with U. S. food production.



THE FOOD SITUATION

Food may turn out to be one of the chief trouble spots of the Marshall program—particularly for American business. Because of the program, food exports will be larger, domestic consumption somewhat smaller, and prices higher than they otherwise would be. In spite of this, Americans should eat about as well next year as in 1947. However, if prices are bid up in the process, wages and industrial costs may climb with them.

As matters now stand Western Europe would plan to spend about $1 billion on U. S. food in 1948. This is less than they spent in 1947. It also is less than Western Europe feels is necessary to realize the minimum standard of living it set up as a goal for 1948. However, the overall supply of grains – by far the largest commodity on the food list – is down this year by 14%. As a result estimates of Europe's food imports have been reduced.

Here is what went into the record export in the fiscal year 1946-1947. (Figures are thousands of long tons).

	Shipments to Europe 1946-7	Total Exports 1946-7
Wheat and Flour (grain equivalent)	6,638	10,520
Other grains	2,572	4,538
Fats and Oils	156	233
Meat (carcass weight equivalent)	195	224
Dairy Products	322	493
Other Foods	1,266	2,425
Total Foods	11,149	18,433

The President's Committee on Foreign Aid has recommended Europe receive about the same total foodstuffs as last year. However, the product mix will have to be changed. Moreover, the rest of the world will get about a million tons less. Wheat will substitute for corn, but even then the total supply of grains available to Europe will be down 700,000 tons or more. Half of this may be made up with a heavier shipment of fats and oils, including peanuts. Dried milk solids, dried fruits and other products will close the rest of the gap.

There is no doubt the U. S. can send abroad whatever foodstuffs Congress finally agrees upon. The big question is whether this can be done without forcing prices higher. Wheat shipments, for example, may run 40% greater than would normally be exported under current circumstances.

Unfortunately no final answer on food prices is possible. On the supply side much will depend on how next years crops turn out. So far crops are off to a bad start, with winter wheat probably below that of a year ago. As for domestic demand, consumers are likely to have at least as much purchasing power next year as this. The problem is to persuade them to use it on commodities that embody less grain.

When all these considerations are added together it is apparent that food prices over-all do not stand much of a chance to fall markedly in 1948. On the contrary, there is more than a small chance they will rise. Moreover, under the Marshall program exports in 1949-50 would still help support farm and food prices. Any substantial decline could be initiated only by a fall in domestic consumption. Needless to say, these are matters that are important to the business community.

Long Range Problems

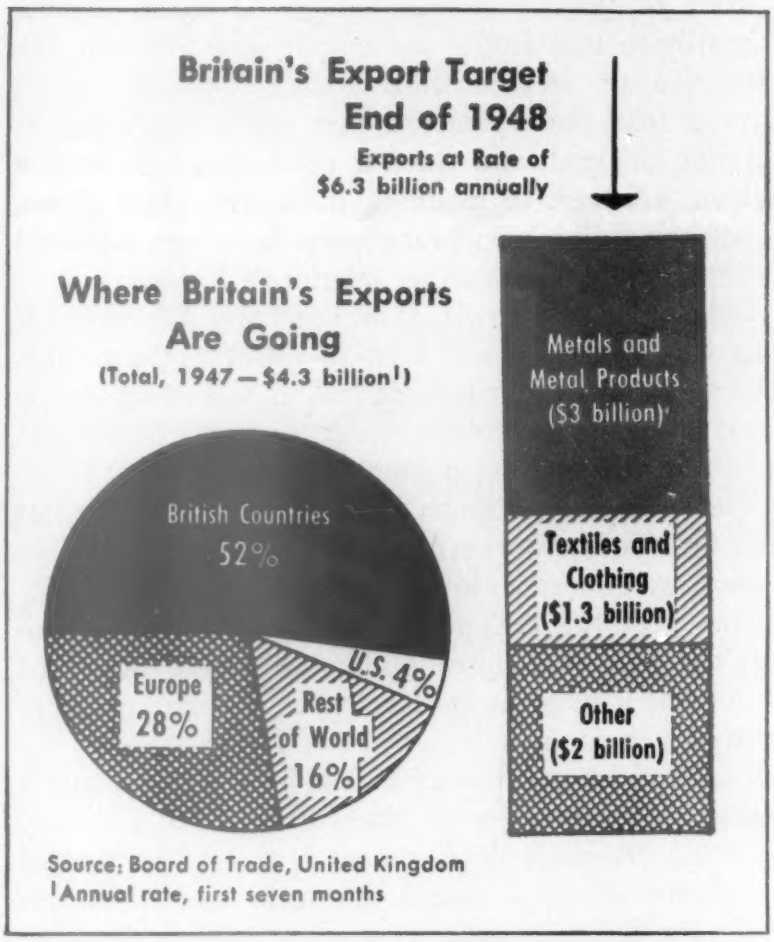
A PROGRAM of the size Western Europe has set for itself inevitably will influence American business over the longer run. New industries are to rise, old ones are to be rebuilt and expanded, exports are to be pushed — all this has a direct bearing on America's foreign markets of tomorrow. Any sound and final judgment concerning the Marshall program, therefore, must weigh certain long run considerations as well as the short.

These longer range considerations are summed up most simply in an assessment of the broad pattern of Europe's future trade. Here a few key trends serve as useful signposts. They are:

a) Industrially Western Europe is preparing to make itself more independent than before the war. This will reduce its imports from the United States. After 1951 export of American manufactures to Europe will be concentrated largely in specialized items which this country has a superior knowledge and skill to produce.

b) Prior to the war Western Europe was primarily an exporter of textiles, industrial products and high quality consumer goods. Industrial revival is along the lines that will push these same products. However, Western Europe's program for expanding industrial capacity points to one significant modification. Capital goods exports — electrical equipment, industrial machinery, finished steel — will bulk much larger than at pre-war.

c) Western Europe's world trade must be considerably larger than in the late thirties. Two developments account for this. First the split in Germany and Europe makes necessary a much larger import of essential foodstuffs and materials from outside the Continent. Second, Europe now must pay for a larger share of its imports with exchange derived from exports. In the Thirties, about one-sixth of Europe's imports represented a return on investments held abroad. While this margin is not eliminated, it has been cut substantially.



d) By far the largest items on Western Europe's import list will be foodstuffs and raw materials. These needs to some extent must govern the location and character of the markets to which it exports. The U. S. must continue to be one such market, for Europe will need our wheat.

A survey of Western Europe's import needs in 1951 shows that Britain and Western Germany are the two countries to whom world trade will be of decisive importance. Other countries will trade as they always have. However, their ability to feed themselves to a large extent lessens their trade burden and makes possible the concentration of much of it within Western Europe itself. It is Britain and Germany, therefore, that are likely to become America's heaviest competitors.

Britain has the world's greatest food deficit. Moreover, its factories are largely engaged in converting the raw materials of other countries into finished goods. Britain therefore must export or die, and that is more true today than ever. The British now have set an export goal that would boost shipments to 175% of their pre-war volume. Later they may pare this. Nevertheless, an export volume at least half again that of pre-war will be necessary for Britain to restore its living standard.

Some clues to what and where Britain will export are available in its current trade pattern (see chart). A close study of this pattern leads to one broad conclusion. The British are concentrating on the export of the same general lines which the U.S. will push. Machinery, automobiles, iron and steel products, electrical goods — these are items that even today stand high on the export lists of both Britain and the United States. Britain in particular must turn to durable goods of this character to replace smaller coal and textile exports.

Prior to the war Britain sought to direct exports primarily to two areas – her empire and Western Europe. Except for foodstuffs from Argentina, British imports from South America were small. This situation has not changed, and there is good reason to believe Britain will seek to maintain it. As the chart shows, about half Britain's postwar exports have been allocated to the Empire, and another quarter to Europe.

Other than in Canada, U. S. firms find it hard to get into this Empire trade. Empire countries have large sterling balances and lack dollars. It is not surprising, then, that they use dollars chiefly for goods Britain can not itself deliver. Such a situation may well last.

The German position is somewhat different, but not radically. Today Western Germany's population of 48 million is almost a fourth greater than in the late thirties. Yet the region can produce little more than half the food it requires. Unlike Britain it must start from scratch in order to develop export markets so as to pay for its food.

Coal will be one money maker for Germany, but it won't earn exchange in all places from which Germany must buy. A likely development is the resumption of shipments of those metal products and chemicals which the Ruhr can produce efficiently and in quantity. Iron and steel products, machinery, chemicals and possibly electrical equipment might be expected to flow from German plants for sale on other continents.

South America, with its food and raw materials, is a natural target for German trade. Such an exchange grew rapidly in the twenties, only to fall victim to the great depression. By the late thirties it was again on the road to revival. The third great push for German-Latin American trade is expected in the fifties.

THE FAR EAST

With Britain enlarging its trade to the Empire and Germany coming into other markets, U. S. traders certainly will feel a competitive pressure that is not present today. How tight that pressure is may hinge on developments in yet another region – the Far East.

The Far East is a vast agricultural and raw material area that has hardly moved to the threshold of industrialization. Yet it has great centers that lend themselves to industrial growth. If political stability were to be established in the Far East, the way would open to a trade greatly benefitting both Europe and the United States, as well as the Far East itself. A surplus of rubber, tin, cotton, wood fibers, and even foodstuffs might then be produced and exchanged for the industrial products of the West.

The Far East, then, is one of the big unknowns in the foreign trade equation of the next decade. Another unknown is the reestablishment of trade between the East and West of Europe. Western Europe's plans count on such trade, and it makes good economic sense. But no one can say for sure that economic sense will prevail in this instance.

These unknowns make any final judgment about the long range success of the Marshall program impossible. This much is certain, however. Without the restoration of East-West trade in Europe, a large expansion of Far East trade becomes an absolute essential. In the absence of both, Western Europe cannot possibly achieve stability by 1952.

Pros and Cons

ANY BALANCE SHEET set up by the business man on the Marshall program will carry a number of items on the liability side. Some of the main entries are these:

The program will be costly – perhaps as much as $15 billion. Through their tax bills business men will bear a good share themselves.

At least for 1948 a number of troublesome bottlenecks will be sustained and even magnified. As a result some producers won't realize the expansion they plan.

The high cost of living, the peg on which many labor troubles hang, will move down very little, if at all, and it may move up.

In helping Europe to reequip itself, American industry is arming a potential competitor. Moreover, the arms it offers are of the most up-to-date variety.

There is no guarantee the program will succeed; as a matter of fact certain conditions essential to its success make it look like a risky bet indeed.

Obviously none of these shortcomings can be taken lightly. Against them, however, can be placed some very weighty items on the asset side.

First, and very important, is the simple but humane consideration that without U. S. aid people in a number of Western European countries will be placed in dire straits. At best they will lack adequate food for a healthy life. At worst they will starve.

The economic situation in Western Europe has a profound political and military meaning for the U. S. This is a matter of direct interest to the businessman. If Western Europe ever loses its political independence to another foreign power, the ultimate cost to America will make the expense of the Marshall Plan look like a mere pittance.

Finally, the Marshall program offers the only hope of realizing some measure of economic stability in a world that today appears permanently upset. In this regard the program can do no harm, but only good. Even if it falls short of its stated objectives, Western Europe will have taken a long stride forward.

The assets outbalance the liabilities.

Reprints of this report are available at a charge of 20¢ each to cover the cost of handling and mailing. Address orders to Department of Economics, McGraw-Hill Publishing Co., Inc., 330 West 42nd Street, New York 18, N. Y.

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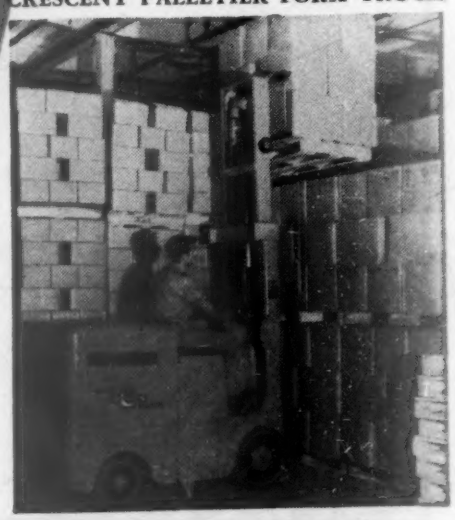


management data 19 sheet

TAFT-HARTLEY LAW COMPARED WITH BRITISH AND SWEDISH PRACTICE

Just how do labor law and procedure in Great Britain and Sweden compare with our own Labor-Management Relations Act of 1947?

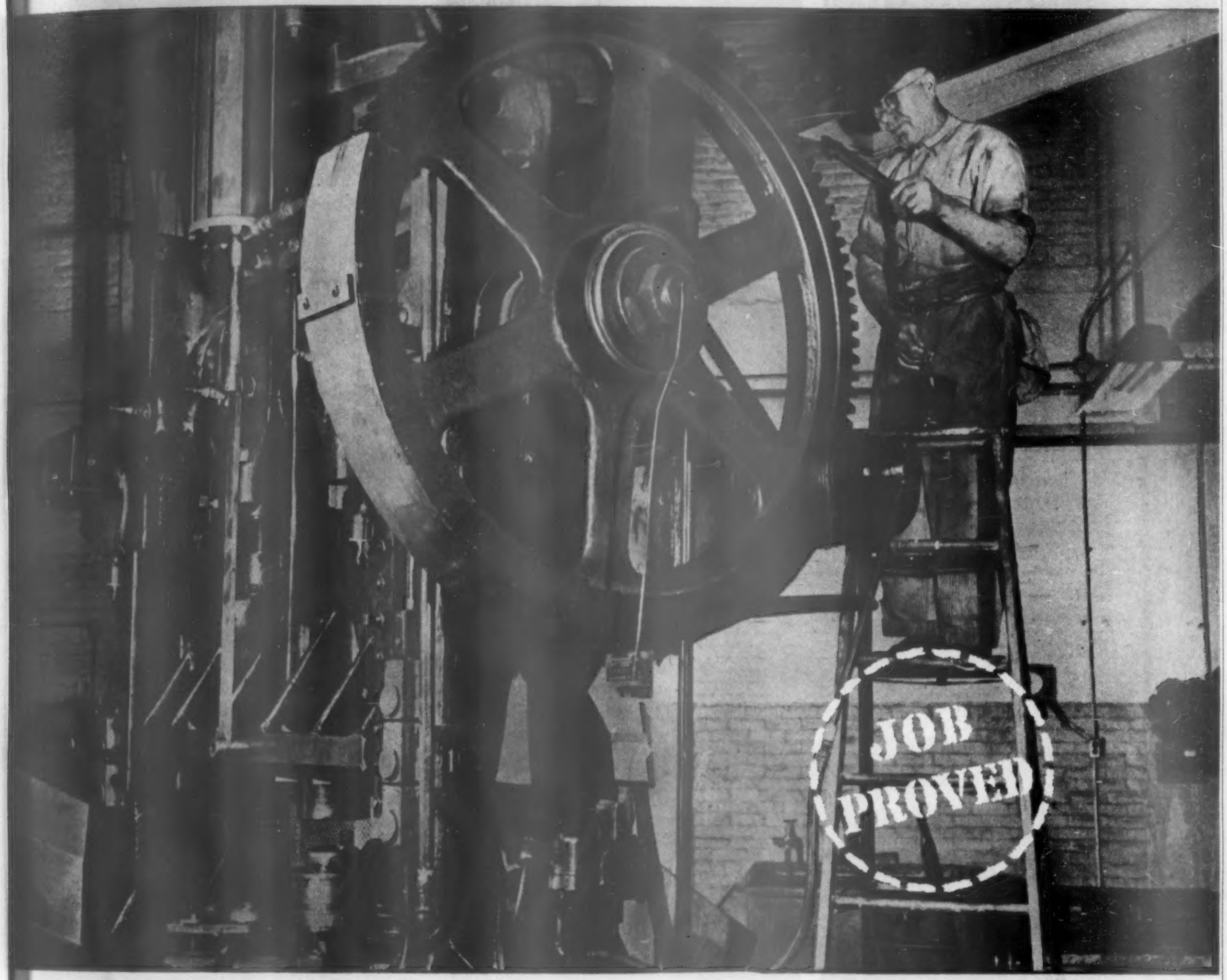
Students of American labor have often stated in general terms that British and Swedish practices are far ahead of those in the United States.

Here is a comparison of the fifteen principal provisions of the Taft-Hartley Law with present laws and procedures in Great Britain and Sweden.

UNITED STATES	BRITAIN	SWEDEN
1. SUPERVISORS can no longer force recognition of their unions, and may be discharged for any union activity.	Foremen are free to press for recognition of union in any way. Private employer may discharge men for union activity. Few employers would dare to do it, because it might lead to serious trouble, perhaps with many unions.	Employers are obliged to bargain with foremen's unions. Unions consider foremen representatives of management. When a man becomes foreman, he gradually drops out of union activities. Collective bargaining agreements often permit employer to insist that foremen belong to separate unions.
2. PLANT GUARDS may belong only to unions limited to guards, and these unions may not be affiliated with any union of production workers.	No comparable legislation. Watchmen may belong to any union and in mixed factories where bulk of workers are organized in one general union, watchmen would belong to same union as everyone else.	No specific point of comparison here. Workers and employers are members of large federations, and neither employer nor worker organizations are subject to regulation by the government. Anyone can join an organization or not.
3. CONTRACT TERMINATION now requires written notice 60 days in advance. Failure to comply constitutes a "refusal to bargain."	Most trade union agreements relating either to wages or conditions run for an indefinite time, or until changed after fresh negotiations. When pay claims are settled, however, it is common for unions to agree with employers' suggestions that settlement of a particular claim will allow no further claim by workers concerned for a specified period. Statutory obligation of 21 days' notice of intention to strike is given to Minister of Labour to enable official conciliation machinery to act.	No cooling-off period, except for a week's notice. Notice of termination of contract generally requires two or three months. During this period wage scales and working conditions may not be changed. No legal provision is needed beyond week's notice of strike, since it is a well-established practice that neither employers nor unions take action until all possibilities of negotiation and mediation have been exhausted.

CONTINUED ON PAGE 132

Bringing Down High Maintenance Costs



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TAFT-HARTLEY LAW COMPARED WITH BRITISH AND SWEDISH PRACTICE

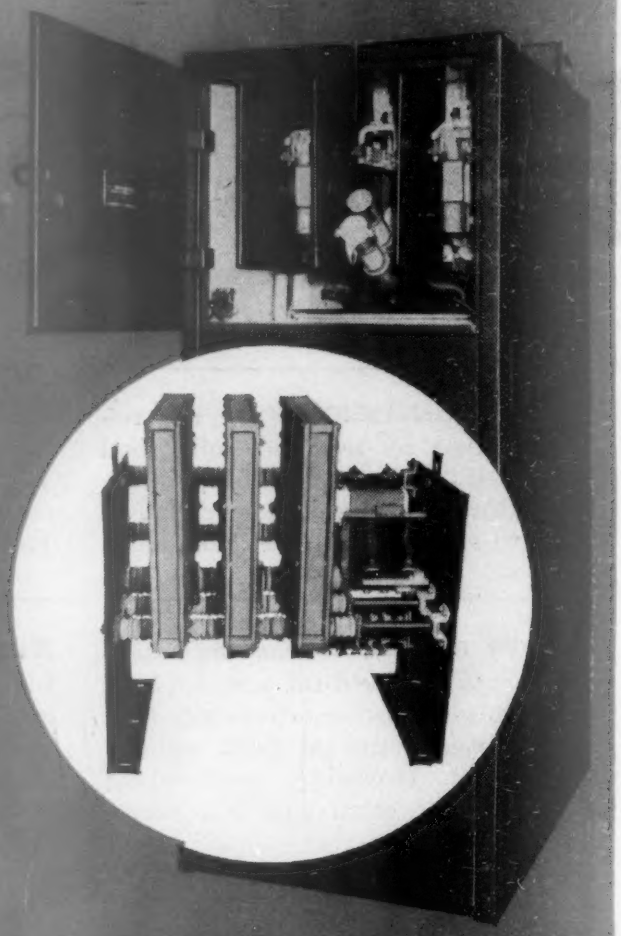
CONTINUED FROM PAGE 130

UNITED STATES	BRITAIN	SWEDEN
4. CLOSED-SHOP CONTRACTS are outlawed at expiration of present contract, or one year from date of Act, whichever is later.	Nothing in British legislation makes closed shops illegal.	Closed-shop clause legally enforceable if it appears in collective agreement. In such cases employer is bound to turn away non-union men seeking work. Employers' confederation does not approve of such clauses, and they are never included in agreements made by members.
5. UNION-SHOP AND MAINTENANCE - OF - MEMBERSHIP CONTRACTS are permitted only if approved by majority of all employees in the unit; effective dates same as for closed shop. Members may still be expelled by union, but may be discharged only if expulsion is for failure to pay dues or initiation fees.	Union shops are common. There are many works in which only members of the unions that organize them can hope to get jobs.	Same as closed shop. Any group can form union and make its own terms of admission to membership. No man can be forced to join union, so risk of undesirable companions is nil. Professional workers' unions are organized in groups separate from labor unions, and lines of distinction are closely drawn. There is no demand for union-shop clauses because almost all workers are union members. Maintenance-of-membership contracts are unheard of.
6. CHECK OFF remains legal, but only if authorized in writing by employees.	Check-off system perfectly legal. System is probably growing. Likely to lead to thorny political problems in nationalized industries.	Unions collect own dues. If employer agrees to check off dues in contract, he is legally obliged to do so.
7. WELFARE FUNDS must be jointly administered; minor limitations on their use are prescribed.	Trade unions run benevolent schemes. Funds are entirely under union administration, with no management share in the direction or use thereof.	Corresponding arrangements to welfare funds in the United States do not exist. Vacation homes and estates provided by companies for workers are generally managed by unions.
8. STRIKES in violation of contract are grounds for action to recover damages in federal courts from union treasury, but not from individuals.	Trade unions are not liable for damage or breach of contract caused by strikes. This was fought out in the early years of this century.	If workers strike while collective agreements are in force, employers can obtain damages through labor courts. A worker striking while a collective agreement is in force can be fired without notice. Courts consider slowdown tantamount to strike.

CONTINUED ON PAGE 134

Motors are hard to get...

Guard them with LIMITAMP CONTROL



Limitamp control is furnished as a single unit, in groups, or in special enclosures for special operating conditions.

Limitamp control can provide those hard-to-get motors with sure, short-circuit protection. In less than *one-quarter* cycle, Limitamp's EJ-2 fuses cut off a rise in current from a short, and clear it in one-half cycle—long before the short has time to harm the contactor or motor. Your plant's power system needs this prompt handling of fault currents, and you will avoid the risk of costly shutdowns that can result from just *one, mad short circuit.*

A STARTER AND PROTECTOR IN ONE CABINET

G-E Limitamp control consists of an airbreak contactor (the motor starter), and EJ-2 fuses (the short-circuit device). They are mounted in separate compartments of one, all-steel cabinet.

Airbreak contactors are specially designed for hard duty. Operating experience has proved they furnish long-lived, low-cost service with only routine maintenance.

Because they operate in air, they eliminate the problem of handling oil. And tip life of airbreak contactors is many times that of comparable oil-immersed tips.

You can depend on EJ-2 fuses for sure, short-circuit protection. They are "fail-safe" devices. There is nothing about them to wear. They are easy to replace.

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Isothermic overload relays, accurately calibrated against actual motor characteristics, guard the motor against overheating from sustained loads or single phasing.

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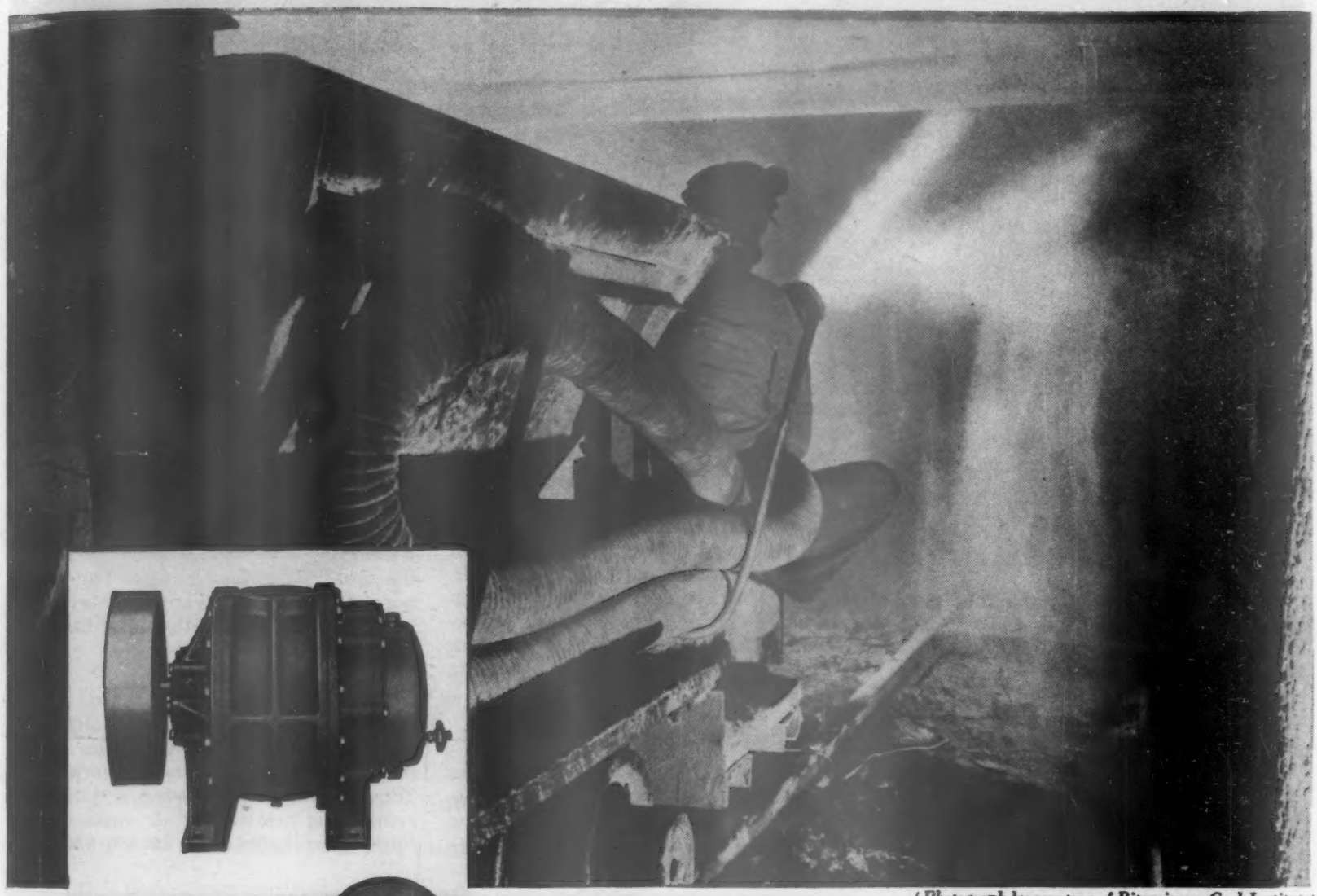
TAFT-HARTLEY LAW COMPARED WITH BRITISH AND SWEDISH PRACTICE

CONTINUED FROM PAGE 132

UNITED STATES	BRITAIN	SWEDEN
9. CONCESSIONS are not required as evidence of "good faith" in collective bargaining. But neither are unions required to recede from their demands.	Collective bargaining is entirely free; either side may make or withhold concessions. Matter of collective bargaining is not subject to statutory provisions.	No legal provision to enforce bargaining in good faith. It is considered good business.
10. GRIEVANCES may be settled with individual employees; union representatives need be present only at final adjustment. However, settlement must be consistent with terms of contract.	No law governing settlement of individual grievances. Employer may do as he pleases, but a trade union branch official or shop steward would normally attend negotiations relating to individual grievances.	Worker is not obligated to channel complaints through union, but he probably prefers to—so does his boss. He would naturally take up the matter first with his foreman.
11. "COMPANY UNIONS" are still suspect; no changes in Wagner Act section dealing with them. But another section directs NLRB to accord independent and affiliated unions similar treatment when circumstances are the same.	"Company unions" are suspect also. But no law prohibits their formation and recognition.	Any group can form a union and make terms of admission to membership. Right of association is guaranteed by law. Unions need no license to negotiate.
12. RIGHT OF FREE SPEECH for management is broadened, but there are still limits. "Views, arguments, opinions" are okay; instructions probably not.	Management is free to say or do what it pleases to influence workers in union affairs. But only a bold employer would dare risk open battle with a union.	It is legal to argue with workers against unions, but general opinion among employers is that it is not a good idea.
13. STRIKES FOR RECOGNITION have not been outlawed, but an employer with a demand for recognition may petition NLRB for an election.	Unions are at liberty to strike for any reason, provided statutory notice of intent to strike is given.	Such difficulties are settled within union circles. Need for legislation does not exist.
14. JURISDICTIONAL STRIKES become an unfair labor practice by unions; may be restrained by injunction if NLRB requests. Unions liable for damages in federal court.	Jurisdictional strikes are legal —but rare.	Damages can be obtained from labor courts for jurisdictional strikes. Jurisdictional disputes are rare. Trouble of this kind is settled with unions themselves, before it flares up.
15. SECONDARY BOYCOTTS, of certain types, are outlawed. Such practices may be restrained by injunction by NLRB, and the union may be sued for resulting damages.	Nothing to make any kind of boycott illegal. It is common for one group of trade unionists not on strike to refuse to handle products of firms where another group is on strike.	Damages can be obtained from labor courts for illegal boycotts.

AIR GOES TO WORK FOR SAFER MINING



(Photograph by courtesy of Bituminous Coal Institute)

In 1858, when the Atlantic Cable carried its first message, "Roots" had been producing blowers for four years, since 1854. We're not good because we're old, but old because we're good!

Coal dust in mines is an old hazard problem. Modern practice minimizes danger by blowing rock dust onto walls and roofs, diluting the coal dust and safeguarding against explosions.

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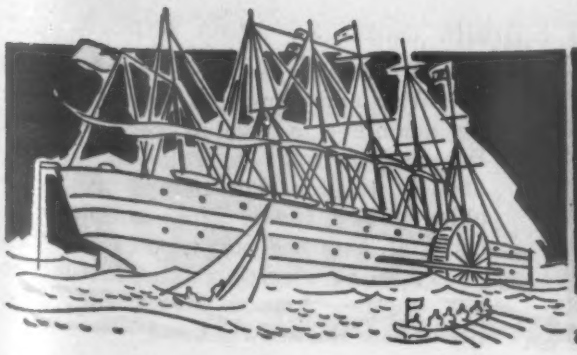

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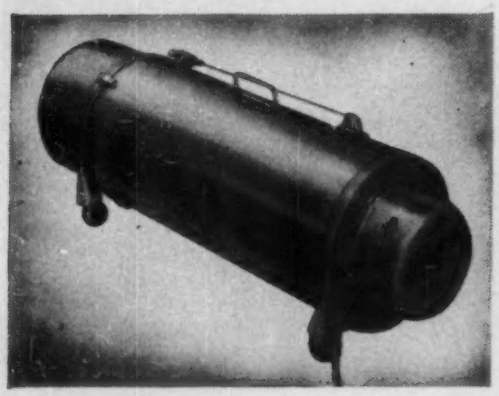
WHAT'S NEW IN EQUIPMENT

Briefed here—for the convenience of plant operating men—are descriptions of industrial plant equipment newly placed on the market

WELDING FUME EXHAUSTER

Suited for operations in cramped, confined quarters, or where the welder must move from place to place in enclosed areas, portable exhauster is designed to remove harmful welding fumes. Weighing 25 pounds, the 34-inch long, 10-inch diameter unit is self-contained, and requires a minimum of maintenance. Exhauster hose is adjustable, and can, if necessary, be held in one hand while the welder works with the other. Filter section consists of 12 fire-proofed filter tubes, each 2 inches in diameter and 18 inches long. The tubes are connected to a spring-mounted frame controlled by a pull cord extending outside of the unit. Fume particles are removed from the tubes by pulling on the cord. Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8.



SEQUENCE CHANGERS

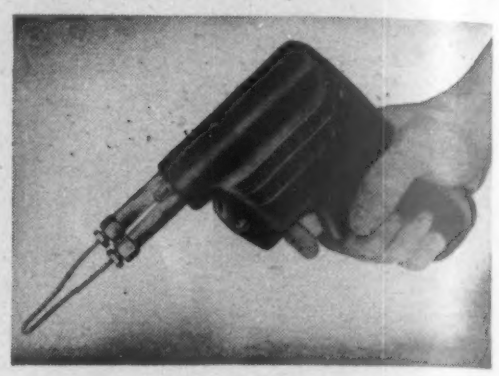
Transposing or alternating the starting sequence on each cycle, Type HR Alternators are suitable for use on any pair of electrically operated units, such as pumps, blowers, and air compressors, controlled by magnetic starters or two-wire circuits. Pilot devices may be any single-pole pressure switches, float switches, thermal switches, or other two-wire control units. Pushbutton stations of the maintained contact type may also be used. The instrument requires no auxiliary contact for its operation. Available for 110, 220, and 440 volts, 60 cycles, it equalizes wear, and operates circuits singly or together. Standby circuit is available when necessary. The unit may be mounted on wall or panel. Has NEMA Class 1 enclosure. Automatic Control Co., 1005 University Ave., St. Paul 4.

FIRE-RETARDANT PAINT

Resistall, a high-gloss fire-retardant enamel paint with alkyd synthetic resin base, can be used for both prime and finish coats. It can be reduced with any of the common thinners and tinted with regular oil colors without impairing its fire-retardant qualities. According to the manufacturer, surfaces painted with the enamel will not flash, flame, or burn, and are protected against attacks of weather, moisture, salt air, and water. The paint can be used on wood, plaster, cement, metal, insulation board, acoustical tile, and other surfaces. Brytenu Chemical Mfg. Co., 408 Madison St., New York 2.

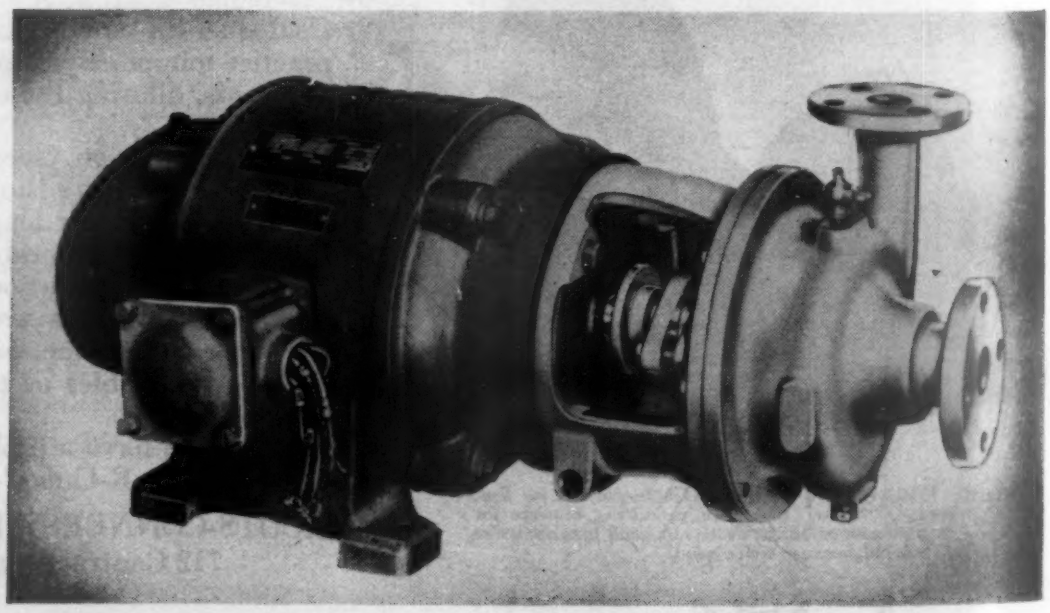
SOLDERING GUN

Light in tip of soldering gun helps locate the connection to be soldered, and illuminates the work. Placed between the terminals of the long loop tip, the spot-light goes on automatically when the current is switched on for heating. Work heat is provided in 5 seconds, maker says, and the power is on only while the gun is in use. Pistol grip handle has trigger switch, and the tool operates on standard a.c. only, 100 watts, 110 volts, 60 cycles. Two models are available—one with a single heat of 100 watts; the other, the dual heat model, with 100 watts normal heat and 135 watts for short-time intermittent duty. Weller Mfg. Co., 815 Packer St., Easton, Pa.



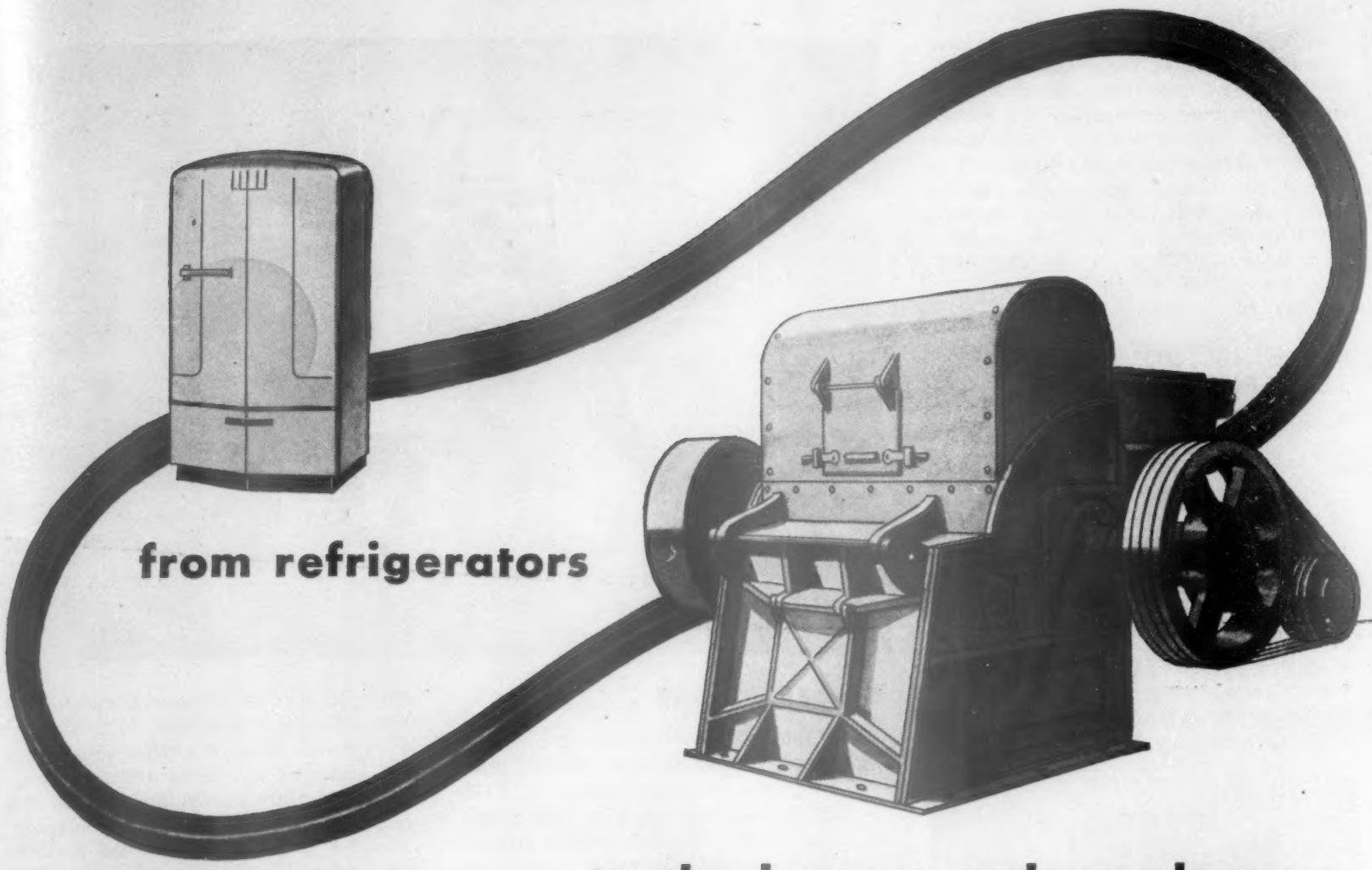
SEALING TAPE

Type 263 Fiberglas industrial adhesive tape is suitable for use in heating, ventilating, and air conditioning work. Applications include insulating, sealing, and reinforcing pressurized air ducts, couplings, flues, tubes, and cables; also re-



CENTRIFUGAL PUMP

Made of corrosion-resistant aluminum bronze, a centrifugal pump suitable for handling acids, salts, alkalis, and other corrosives. Present models are 1½x1¼-, 2x1½-, and 2½x2-in. sizes. Capacities range up to 240 g.p.m., and the heads to 170 feet. The pumps are single-stage, single-section, closed-impeller units. All liquid passages are designed for quiet operation and minimum wear. Impellers are machined to develop specific ratings. Bearing thrusts are relieved by hydraulic balance. The pumps are available in two types: close coupled and pedestal. The pedestal type can be connected to an electric motor, turbine, or gas engine. Ampco Metal, Inc., 1745 South 38th St., Milwaukee 4.



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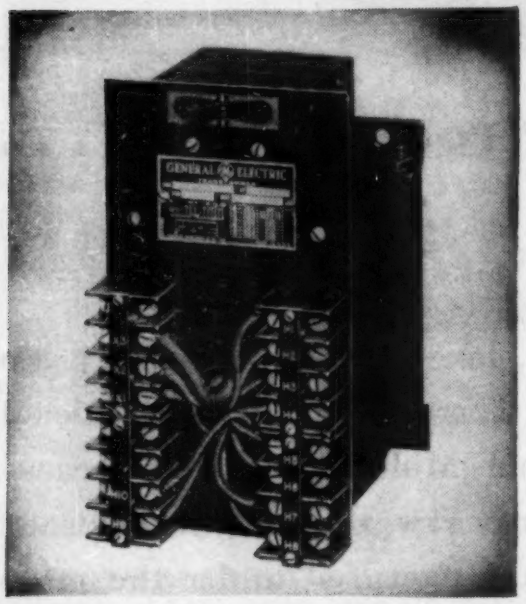
placing caulking cements, metal clamps, screws, and joints. Described as a thin, light, strong fabric tape which provides a permanent seal, it consists of a Fiberglas cloth backing with a vulcanizable adhesive. The backing does not shrink or stretch, resists heat, light, and deterioration, maker states, and the adhesive is pressure sensitive to facilitate application. Bauer & Black, Div. of The Kendall Co., 2500 South Dearborn St., Chicago 16.

MACHINE TOOL TRANSFORMERS

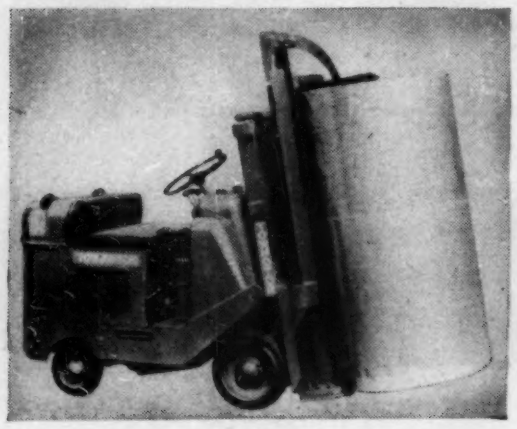
Ranging in size from .075 to 3 kva., machine tool transformers, made in 10 ratings, are suitable for use on 60-cycle circuits of either 220 or 440 volts. For 25-cycle applications, they are listed in four standard sizes ranging from .150 to .500 kva. Have primary voltage taps for 220, 440, and 550 volts. The line includes an all-purpose group of transformers rated for both 50- and 60-cycle supply circuits. The primary is equipped with 8 voltage taps ranging from 208 to 550 volts. Have standard 110-volt secondaries with 92-volt taps for operation



of 60-cycle relays on 50-cycle circuits. Front-mounted terminal board of plastic facilitates wiring. The transformers are equipped with built-in overload protectors with time-delay action. Specialty Transformer Div., General Electric Co., Schenectady 5.

PAPER UNLOADER

Clamp attachment for fork lift truck unloads paper rolls from freight cars automatically. The accessory consists of



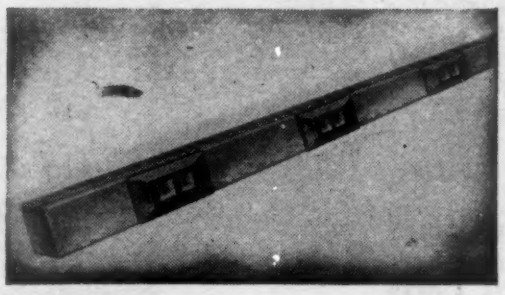
a blade at the bottom for insertion beneath the roll, a cradle-type backrest to support the roll, and a hydraulically-operated clamp. Raised and lowered by the lift truck operator, the clamp can be used to high-stack the rolls of paper on end to conserve storage space. The roll clamping plate, 20 inches in diameter, is lowered hydraulically to take the load. The clamp handles rolls with a maximum length of 76 inches. Adjustable extensions permit handling smaller rolls. Towmotor Corp., 1226 East 152nd St., Cleveland 10.

THICKNESS GAGE

Corrosion and wall thickness can be measured from one side of metallic surfaces by gage that tests steel from 0.125 to 2.250 inches. The portable instrument is designed for non-destructive inspection and testing of metallic containers, boilers, pressure vessels, and piping while in service. Measures within 3 per cent of actual thickness. It combines a 4-electrode probe, a small 6-volt battery, an electronic voltmeter and power supply, and interconnecting cables. The cables permit the probe to be moved about at a distance from the metering equipment. Scott Electroflux Co., Waltham, Mass.

PREWIRED RACEWAY

Prewired Plugmold, in 3- and 6-ft. lengths, has outlets wired in position on either 6- or 18-inch centers. Permits con-



venient outlets to be added or relocated. The $\frac{9}{16}$-inch deep by $1\frac{3}{16}$-inch wide molding is furnished in unit and standard packages, ready to install, each length with a connector block at one end and a No. 1910B blank end fitting on the other end, and wired for connection to the adjoining section. Each length is also provided with a cover coupling and No. 6, 1½-inch flat-head wood screws. No tools other than a screwdriver are required for installing. The Wiremold Co., Hartford 10, Conn.

ELECTRONIC SPEED CONTROL

Regutron provides excitation and speed control of boiler draft fans and centrifugal pumps, compressors, and blowers on which magnetic drive is used. It rec-

tifies 3-phase supply current to energize the magnetic drive, and adjusts value of current to hold operating speed of load to within plus or minus 1 per cent of selected speed. Speed of the load is adjusted by automatic or manual positioning of a small potentiometer. Other components of the control system guard against effects of overvoltage, under-

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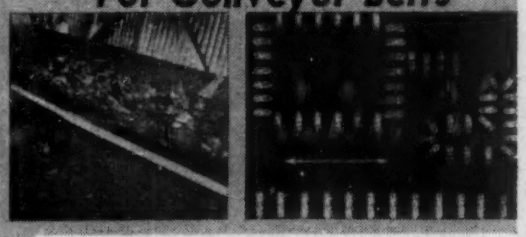
Present Day Practice in Belt Fastening

Every man who has anything to do with the purchase, application or maintenance of conveyor, transmission or V-belts will find the bulletins listed below of considerable value in connection with belt fastening work. A knowledge of present day practice in belt fastening helps reduce the loss in machine hours due to belt failures caused by the use of the wrong type of fastener or improper application. We shall be glad to send any or all of them to you or to any of the men in your organization.

For Conveyor Belts



FLEXCO HD Belt Fasteners are used to make a "water-tight" butt joint in conveyor belts ranging from ¼" to 1½" thick and of any width. The view on the right shows the various types of rips that can be repaired with these fasteners and Flexco HD Rip Plates.

Bulletin F-100 gives complete details on how to fasten and repair conveyor belts.

For V-Belts

ALLIGATOR V-Belt Fasteners are now being widely used to fasten B, C and D, open-end V-belting of cross woven fabric core construction now being made by most belting manufacturers. The view at the left shows a typical application of these fasteners to a drive where endless V-belts would require dismantling the machinery to put the belts on the sheaves.

Bulletin V-205 gives complete instructions on how to use V-belt fasteners.

FLEX V Fasteners for A and B belts are also available for lighter duty V-belt drives. Ask for **Bulletin V-14.**

For Transmission Belts

ALLIGATOR Steel Belt Lacing is in world-wide use to make smooth, flexible joints in leather, rubber, balata, stitched canvas or solid woven belts up to ⅜" thick and as wide as they come.

Bulletin A-60 tells how to fasten and repair transmission belts.

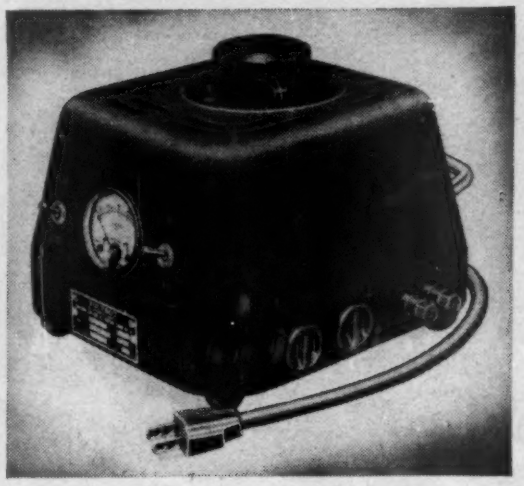
Sold by Supply Houses Everywhere

FLEXIBLE STEEL LACING COMPANY
4678 Lexington Street, Chicago 44, Ill.

voltage, short-time power failure, and improper operation of tubes or amplifier. Speed is held constant, manufacturer states, despite variation in prime mover speed or changes in load or voltage. Electric Machinery Mfg. Co., Minneapolis 13.

VARIABLE A.C. UNIT

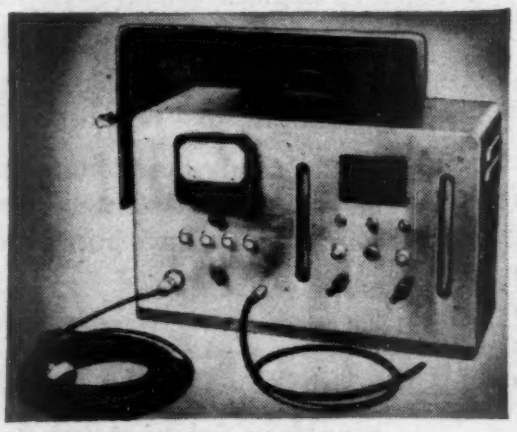
Portable Voltbox, a source of variable a.c. voltage, is made in Types UC1M, for 115 volts, and UC2M, for 230 volts. Contained in the cast-aluminum case are a



Powerstat variable transformer; a voltmeter, accurate to 2 per cent; three output receptacles and a set of binding posts; an "on-off" switch and "line-load" switch; renewable fuse; and a 6-ft. cord-plug which connects to a 50/60-cycle, single-phase source. Knob at top of the box permits a continuous adjustable output voltage from no voltage to 17 per cent above line voltage at any or all of the output receptacles and the insulated binding posts. Overload protection is provided. The Superior Electric Co., 643 Laurel St., Bristol, Conn.

TOXIC GAS ANALYZER

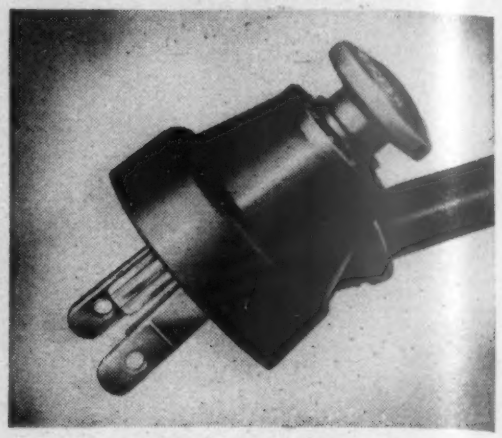
Determining and analyzing the concentration of gases or vapors in their toxic range, Micro-Gas analyzer works on the principle of electric conductivity of solutions. It is suitable for any gas that will ionize in water, with or without heat. Includes all chlorinated hydrocarbons, carbon disulphide, hydrogen sulphide, and sulphur dioxide. Readings may be made directly and continuously by minor adjustments, as well as changed from one gas to another. A chart indicates the flow rate of both water and air for the gas being determined. The instrument is portable, weighing 33



pounds. Operates from 110-volt a.c., 60-cycles. Davis Emergency Equipment Co., Inc., 45 Halleck St., Newark 4, N. J.

LOCKING PLUG

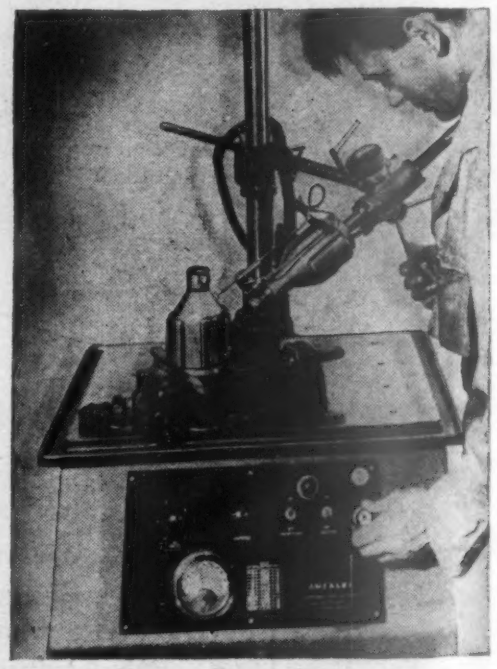
Fitting any standard outlet, Neolock "105" locking plug, made of neoprene,



requires no special attachment. Finger-tip pressure on a plunger attached to a sliding wedge forces the prongs of the plug against the contacts of the receptacle, locking the plug, and forming a positive contact. It is unlocked by pulling out the plunger. No twisting or turning is necessary. Approved by the Underwriters' Laboratories, the plug has no exposed metal parts, and incorporates strain relief. Neoline, Inc., 130 South Hewitt St., Los Angeles 12.

DRILL & TAP DISINTEGRATOR

Automatic disintegrator is designed to remove taps, drills, studs, and reamers from die sections, castings, hardened steel, brass, bronze, and most alloys,



without distorting or heating the casting or the machined part. Electrodes are used to remove the obstruction, and when adjusted in position the disintegrator completes the operation. Revolving head can be swiveled to any angle or compound angle. Can be used horizontally, upside-down, to a height of 7 feet, or close to the floor. The extended arm has a radius of 4 feet. The standard unit has casters. Also supplied in a model for bench use, and a portable unit for drill

Maximum Capacity Minimum Width

Streamlined shape and rugged construction speak for the stamina of this new McKissick Traveling Block. But a look inside, where four Hyatt Roller Bearings carry a 200-ton load, shows how the bearings contribute to highly efficient design and operation.

These bearings are Hyatt Hy-Load Type, which feature high radial capacity for minimum bearing width—making possible the narrow sheaves for block compactness which, in turn, permits maximum derrick working space.

The bearings are used without inner races, the rollers operating directly upon the hardened surface of the pin. Three advantages result: larger pin size for given bearing rating—easier assembly because there are no inner races to apply—better lubrication.

Wherever Hyatts are used you'll find sweeter design and sweeter performance, like this. It's a combination that has won for Hyatt and Hyatt customers millions of friends not only in the oil field, but in mining, transportation, agriculture, construction, and throughout all industry.

It will pay *you* to look into the advantages of Hyatt Roller Bearings for your product, and Hyatt Engineering Service is available to help you do it without cost or obligation. Write to Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARINGS

This Valuable *Free* IDEA BOOK

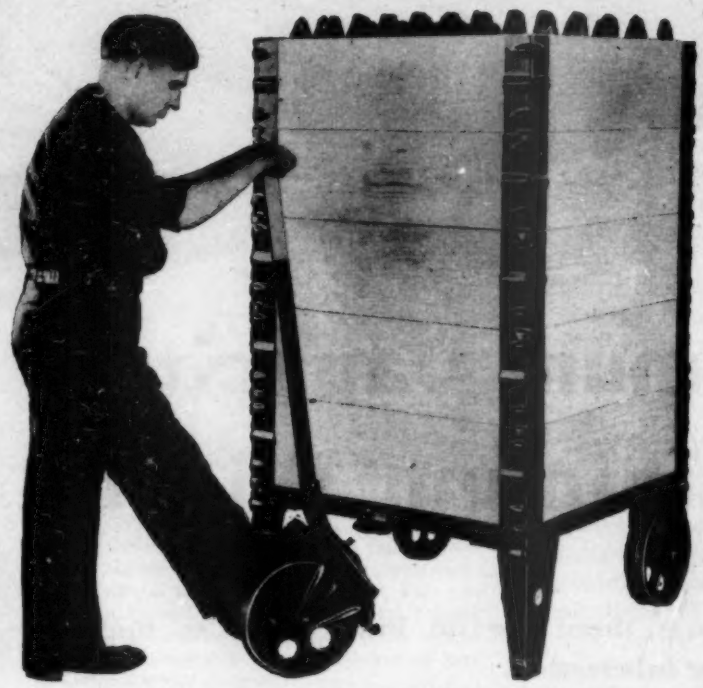
tells you how to

SAVE 50% *with*

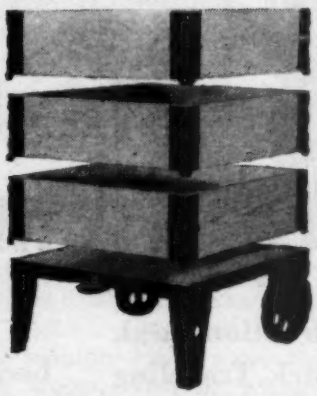
FLOOR SPACE
LABOR COST
EQUIPMENT COST

THE TURNER SYSTEM OF MATERIALS HANDLING

Just off the press and full of important new ideas on reducing the high costs of material handling, this new book on the TURNER SYSTEM offers a real contribution toward making greater profit in almost any size business.



In addition to outlining the TURNER SYSTEM the book describes a plan for using a standardized series of interlocking and interchangeable units which can be applied at a saving to practically every plant operation. This plan cuts labor, handling and storage expense, speeds production and reduces accidents. The book is sent without charge.



"DELIVER THE BIN AND SAVE THE HANDLING" is typical of Turner System savings. Wooden-side or All-steel Bin Sections, Racks, Trays and Die Tables fit on the Turner Transport which is moved by hand jimmy, power lift truck, crane or tractor.

BINS ARE ALWAYS THE RIGHT SIZE because Bin Sections are removed as load diminishes, added as load increases. No time wasted "diving" to bottom of oversize bin.

PALLETS THAT LAST 10 YEARS INSTEAD OF ONE

If you have been throwing money away on expendable pallets, these new, rugged, 8-way accessibility pallets can bring you remarkable savings. They stand up for years under hard use, function efficiently with hand or power lift trucks, stack on themselves and other units.

Floor Plate Deck Pallet. Wooden or Flat Steel Decks also available.

SEND FOR YOUR COPY OF THE TURNER SYSTEM BOOK TODAY!

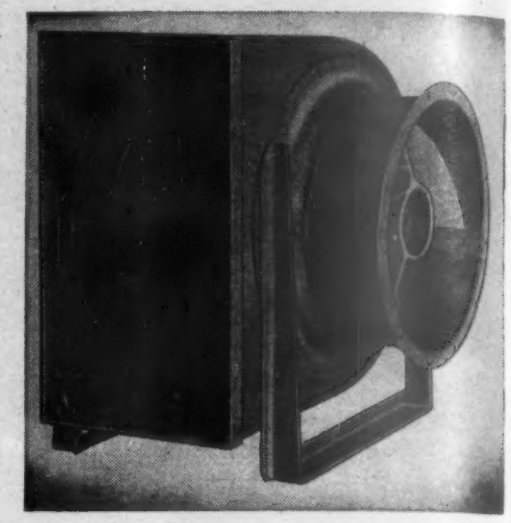
FACTORY SERVICE COMPANY

4605 N. TWENTY-FIRST STREET MILWAUKEE 9, WISCONSIN

press operation. Automatic feed and control permit 24-hour operation without overheating. Ansaldi Tool & Eng. Co., 4744 12th St., Detroit 8.

AXIAL FLOW FANS

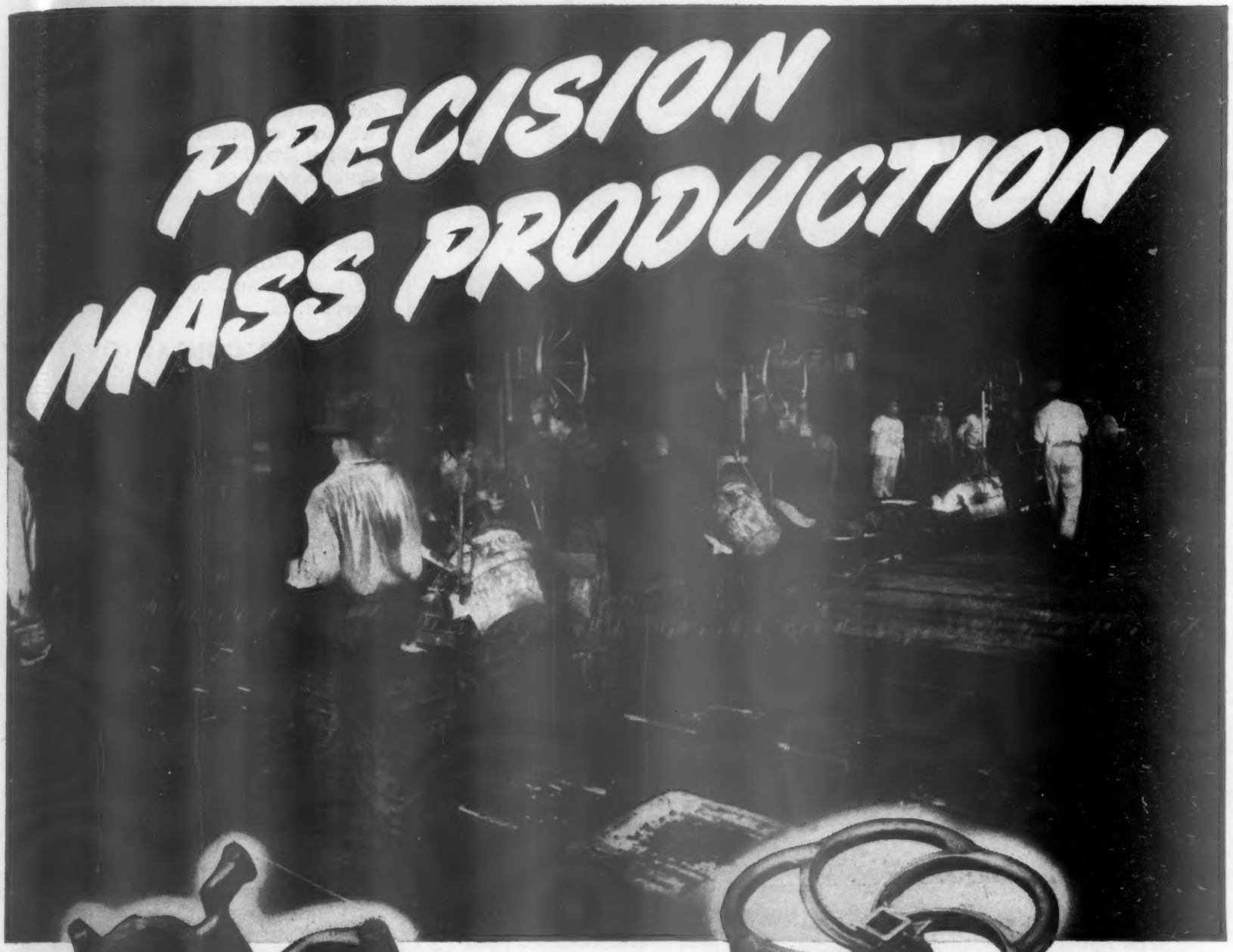
Two basic types of axial flow pressure fans are available, the straight-through type or the convertible elbow type. Both are furnished with either the 3-bladed

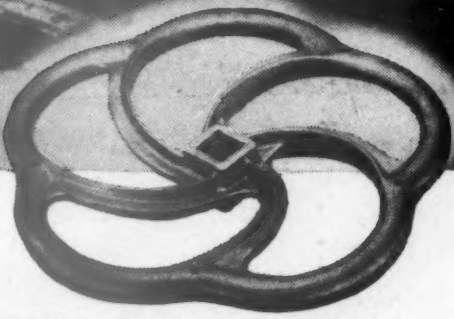


aluminum alloy wheel, or 8-bladed steel wheel. Applications include air conditioning, dust and fume removal, machinery cooling, mechanical draft for combustion, industrial drying, and processing. Designed for either vertical or horizontal operation, the Axiflo fans feature straight air flow, and simplified mounting. The convertible elbow type, with motor, belt, and bearings located outside the air stream, is suitable for high temperature service. Sizes vary from 18 to 72 inches; static pressures from 0 to 3 inches, and displacement from 2000 to 115,000 c.f.m. Westinghouse Electric Corp., Sturtevant Div., Hyde Park, Mass.

LIMIT SWITCH

Type LMR5 limit switch has actuator consisting of a rotary-action lever arm with roller. The arm is adjustable through 360 degrees, with 90-degree





. . . meets "TRANSPORTATION'S" demands!

Day in and day out, Unitcast's precision mass production is solving transportation's complex castings problems.

With transportation castings, dependability is foremost. On trucks, trailers, busses and railroads, dependable castings of the highest quality and uniformity must be delivered—and are being delivered by Unitcast—to meet the toughest specifications.

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Unitcast Corporation, Toledo 9, Ohio.

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AIR COMPRESSOR

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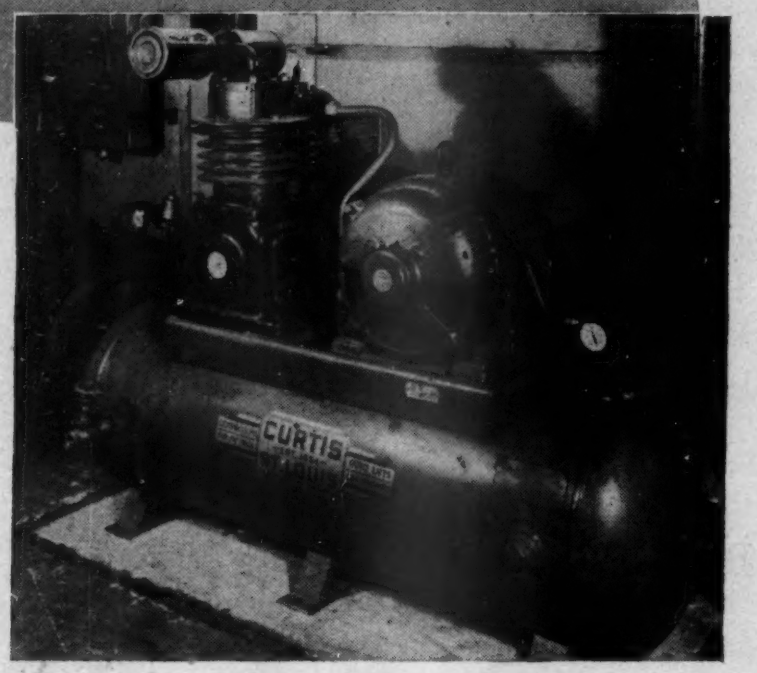

In the plastic division of Presstite Engineering Co., St. Louis, this Curtis Air Compressor is the sole source of air — and because compressed air is essential to all types of plastic extrusions, dependability is all-important. Operating continuously 24 hours a day, this Curtis Compressor has given "completely satisfactory service."

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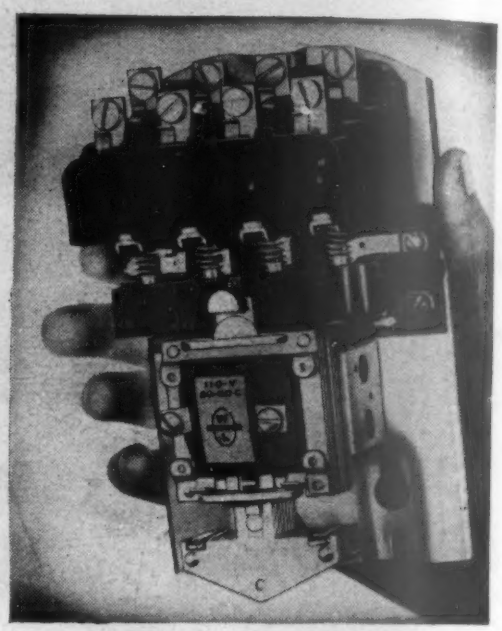
travel in either direction. The housing is sealed except where the actuator shaft enters the housing. The long actuator shaft bearing provides protection against dirt, dust, moisture, and the occasional splash of liquids. The conduit fitting has standard ½-inch 14-NPSM internal threads. Holes are provided for four-position mounting on either face with No. 8-32 screws in tapped holes from the back, or with No. 6-32 screws through the housing and cover. Micro Switch, Freeport, Ill.

SOLENOID CONTACTORS

Bulletin 4451, size 1 a.c. solenoid contactors are designed for use as main line, reversing, or accelerating contactors on a.c. motor controllers for machine tools, air-conditioning equipment, pumps, and compressors. The solenoid contactors are



equipped with double-break silver-to-silver contacts brazed directly to line and load connection terminals. Contactor parts are arranged on a steel mounting plate having recommended NEMA standard mounting dimensions. Available with up to four main poles, the contactors have 7½-hp., 440-550 volts on 3-phase, 60-cycle maximum ratings. Standard operating coils are obtainable for 110-, 220-, 440-, and 550-volt operation on frequencies of 25, 50, and 60 cycles. Ward Leonard Electric Co., Mt. Vernon, N. Y.

HAND CLEANER

Crude oil, grease, tar, gum, varnish, creosote, printer's ink, and almost any substance not soluble in water, are said to be removed by OB hand cleaner. Rubbed into the hands like soap, and wiped off, it dissolves deep dirt with one application, maker states, without irritating the skin. Also protects hands from chapping, and keeps tool handles free from oil and grease. Packaged in 1- and 5-lb. cans. Oil Base, Inc., Box 3735 Terminal Annex, Los Angeles 54.

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Cutting tool in the Cut-Master machine can be changed to adapt the unit to different functions. Single-degree calibrated scale is provided for miter, rip,

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Even if used under pressures severe enough to burst the tubing, PARKER *3-Piece* Tube Fittings remain intact . . . and do not leak or distort. Pictured is just one sample from thousands of tests that have been made—all with the same leakproof performance result.

PARKER Tube Fittings control vibration better. They're easy to assemble . . . may be reassembled repeatedly. Shapes are machined from high-strength forgings. Offered in the widest range of shapes and sizes in brass, steel, stainless steel—and aluminum. Two styles—*3-Piece* flare-type and flareless Ferulok. Warehouse stocks conveniently located in all major industrial centers.

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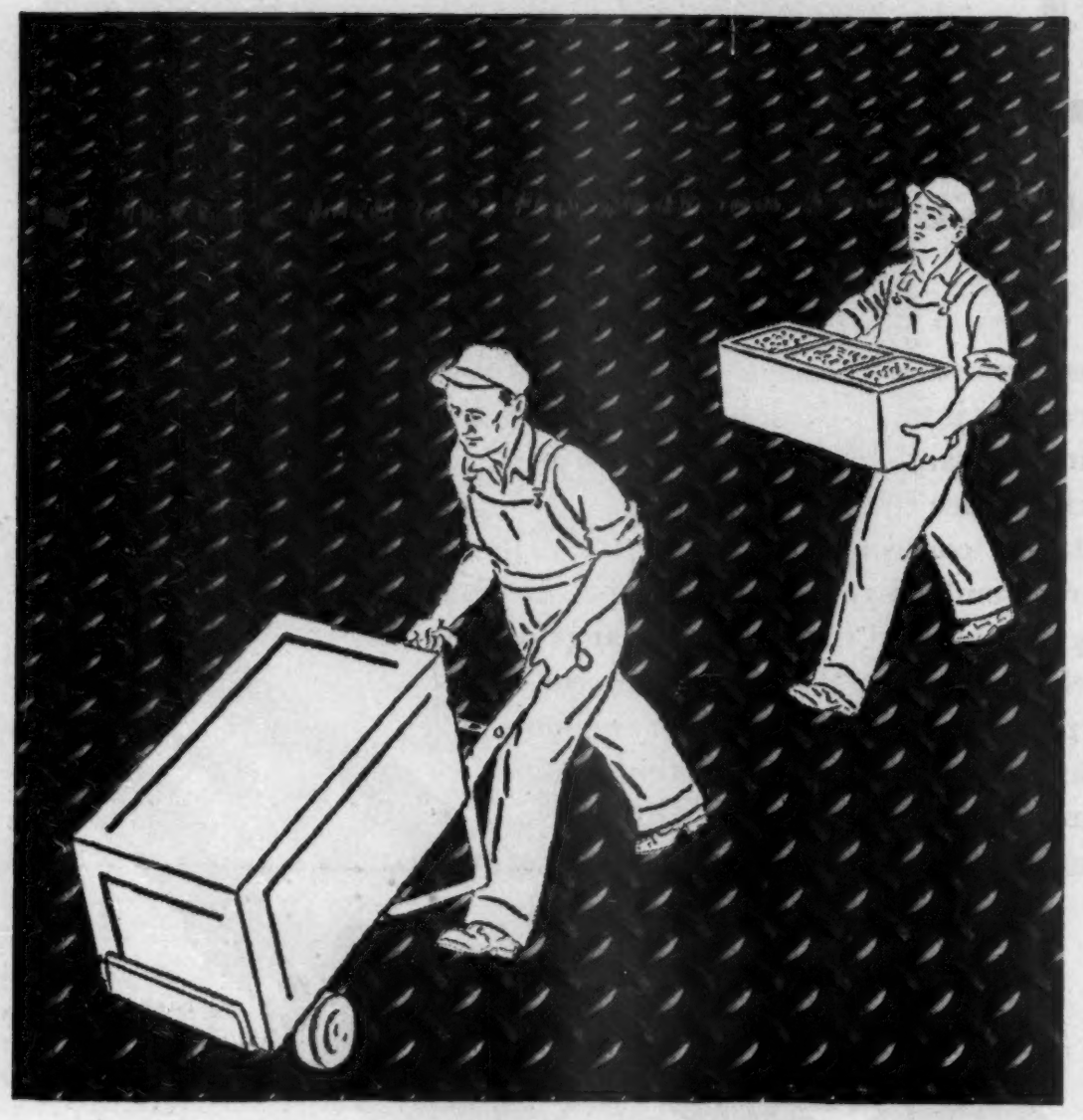

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Men and trucks start faster, move faster, and stop quicker on this super-tough safety steel flooring. The angular projections resist slipping and skidding, and provide positive traction even when wet. Use Inland 4-Way Floor Plate for floors, steps, platforms, ramps, or catwalks in your plant, or on mobile or stationary equipment you manufacture. Furnished in three size patterns and many thicknesses. Inland Steel Co., 38 S. Dearborn St., Chicago 3, Illinois. Sales Offices: Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, St. Paul.

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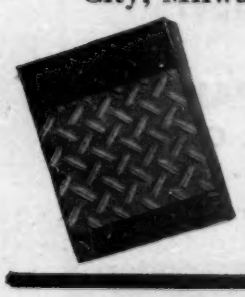

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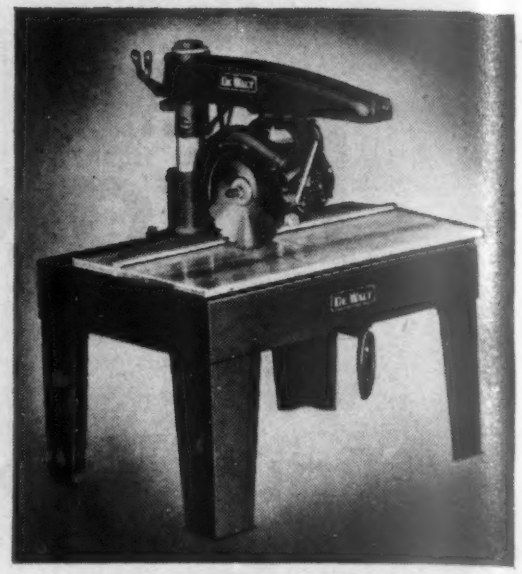
INLAND STEEL



and bevel cutting. Simple mechanism alignment adjustments, and kickback device with multiple dogs for safety in ripping are furnished. Front elevation mechanism, with an adjustable crank handle, is conveniently located in front of the operator. Start-stop switch control is recessed on front end of machine arm. Work table provides ample working space for handling materials or in set-ups for "gang" cutting operations. Motor yoke, of heat-treated aluminum, holds motor in any position with brake type clamp action. The motor is direct-drive type. Available in 3-, 5-, and 7½-hp. sizes for any voltage, cycle, and phase. DeWalt, Inc., 63 Fountain Ave., Lancaster, Pa.

SOLENOID HIGH-VACUUM VALVE

Direct-operated solenoid high-vacuum valve, requiring no pilot or other medium, operates on 110-volt d.c. Claimed

to offer instant control, it is of poppet design, and has corrosion-resistant internal parts. Resilient synthetic-rubber-type seating provides a positive seal. No packing is required. Airmatic Valve, Inc., 1643 East 40th St., Cleveland.

SMALL FORK TRUCK

Type FQH-10 center-control fork truck is a small, lightweight battery-powered unit of 1000-lb. capacity. Suitable for use in narrow aisles, congested areas, and small and low-capacity elevators. The truck has a 36-inch wheelbase, and overall length, excluding forks, of 53⅝ inches. Can make a right-angle turn in 67½ inches plus length of load. It is 28 inches wide, and weighs 3800 pounds with load. The travel controller pro-

this tooth

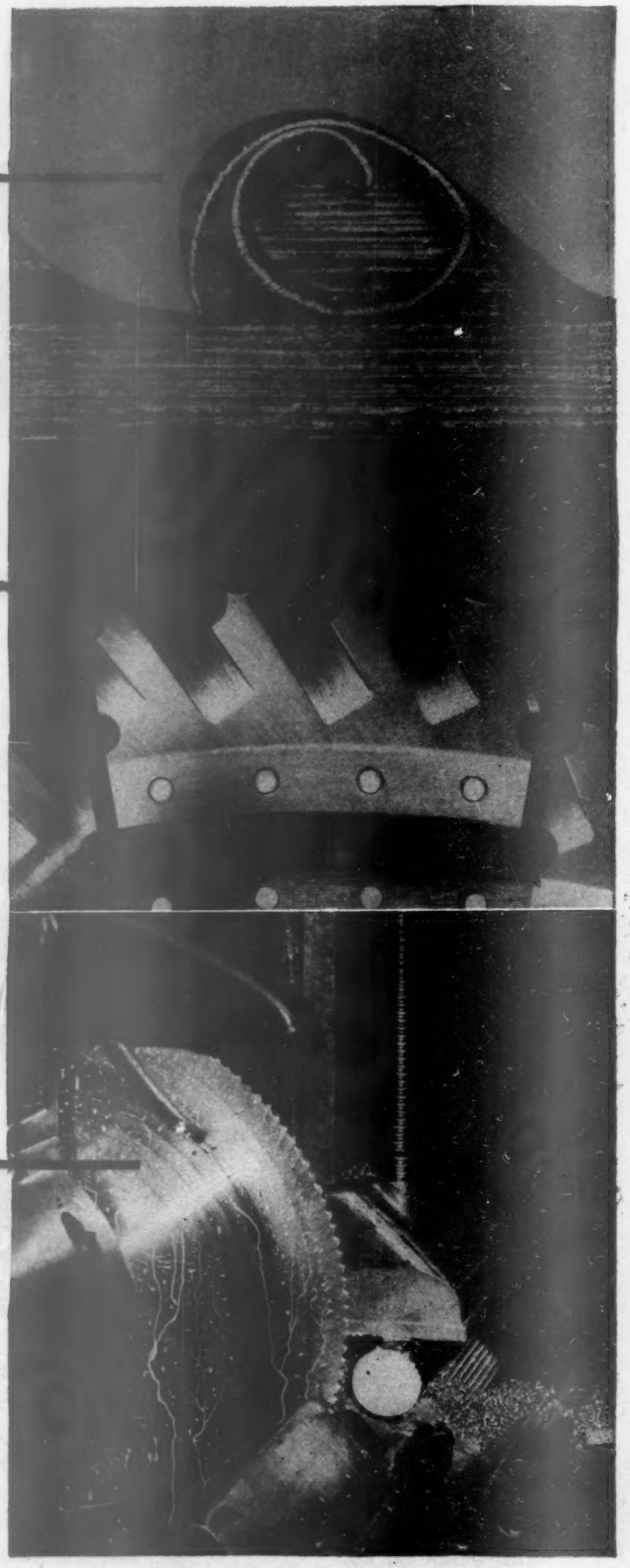
This is Atkins "Curled-Chip" tooth—the tooth with a curved cutting face that LIFTS chips with a smooth continuous cutting action...curls them up to be expelled from the gullet like a suddenly released clockspring. Result: faster cutting with less power, heavier feeds, truer cuts.

in this segment

"Curled-Chip" teeth in segments, as shown, permit a standard cutting width consistently narrower. Segmental construction gives great resistance to the shock of heavy duty work. Worn-out teeth can be easily and quickly replaced without discarding the saw disc.

acts like this to cut costs

This combination—"Curled-Chip" teeth in high speed steel segments—produces results like these: 100 seconds per cut on 5½" C. R. steel...16 sq. in. per minute on SAE 1020 steel...10 seconds per cut on 2½" electric cast steel...3 minutes per cut through 18" by 18" aluminum ingots...25 seconds to cut 14 nested bars, 1⅝" SAE-1335. With performance like that to shoot at, we suggest you discuss your heavy-duty metal problems with an Atkins Cutting Engineer.



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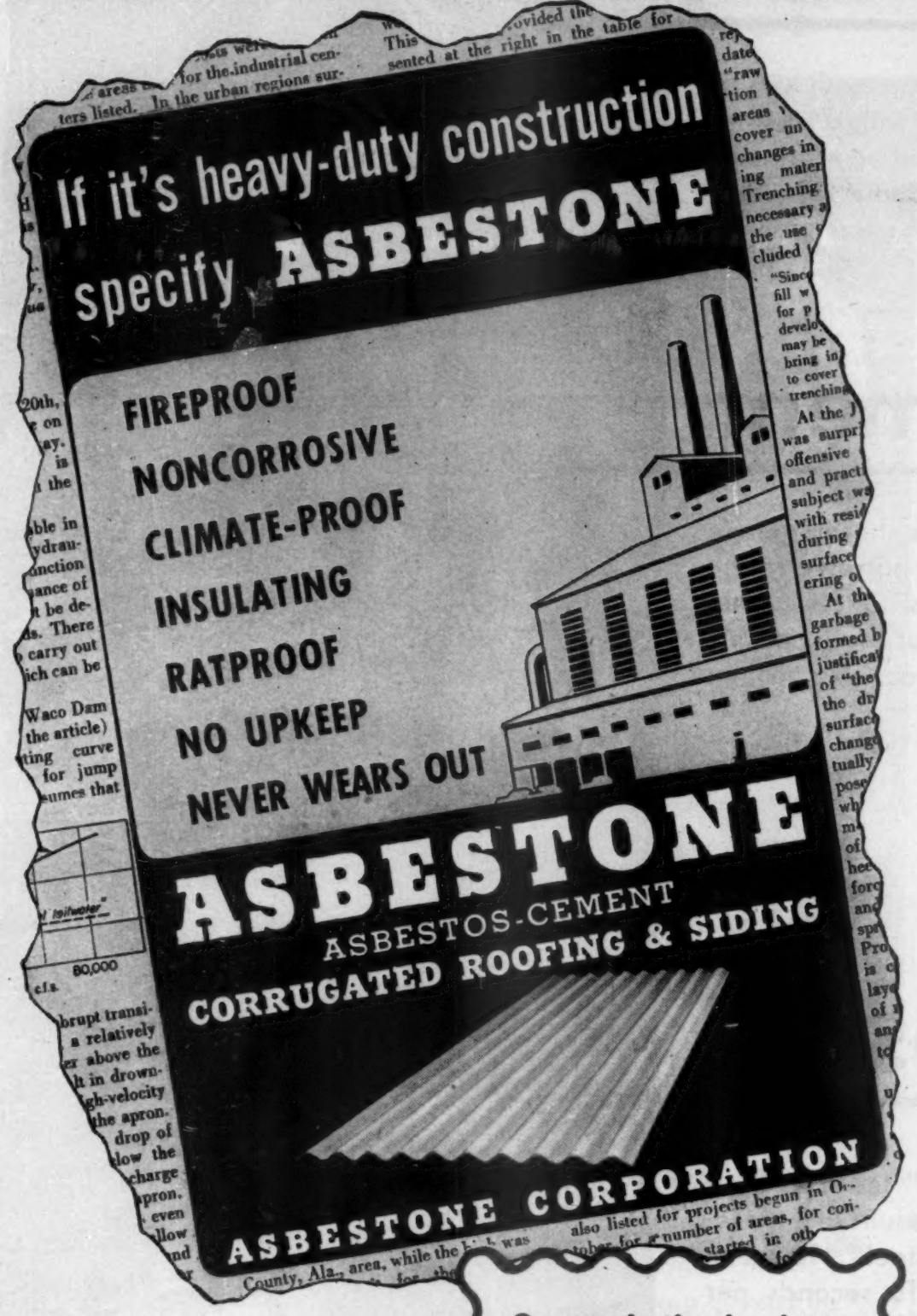

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Our production has been concentrated on ASBESTONE Corrugated to assure prompt delivery for industrial construction. Free Engineering Service available on request —shows you how Asbestone can be adapted to your needs.

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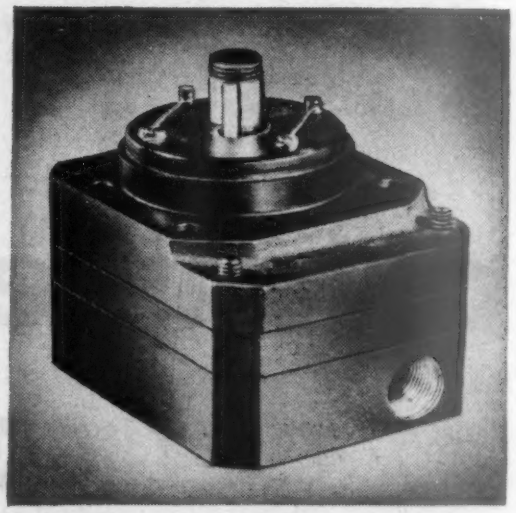
vides three speeds forward and reverse. The circuit is made and broken by a contactor. Truck is furnished with battery and automatic motor-generator-type charger. The battery has 6.7-kw.-hr. capacity, and provides power for 12 hours of work. Baker Industrial Truck Div., The Baker-Raulang Co., 2168 West 25th St., Cleveland 13.

HYDRAULIC GEAR PUMPS

Models 9000 and 9075 hydraulic gear pumps have been developed for continuous service at pressures up to 1000 p.s.i., and for intermittent service at



pressures up to 1500 p.s.i. Model 9000 has a capacity of 8-g.p.m. displacement at 1800 r.p.m.; Model 9075 has 15-g.p.m. displacement at 1200 r.p.m. The pumped fluid may be any oil with a lubricating quality. Suitable for pressure lubrication and oil-hydraulic service, the pumps employ a minimum of moving parts. Wear-resisting materials are used, such as Nitralloy gears operating inside chrome plated faces of cast-iron housing. Have pilot-type flush mounting face. Can be directly driven, or used with belt, gear, or chain drives. Line of 2-, 3-, and 4-way valves has been designed for use with the pumps. The Aro Equipment Co., Bryan, Ohio.

DISINFECTANT

Used as a disinfectant, germicide, and deodorant, Rodalon-10% is said to have a phenol coefficient of 40 at 20 deg. C. Comprising a high molecular group of alkyl dimenthyl ammonium chlorides, maker states the liquid is non-poisonous and non-irritating to tissue, does not stain, and has a mild pleasant odor. Can be used for sanitizing eating and drink-

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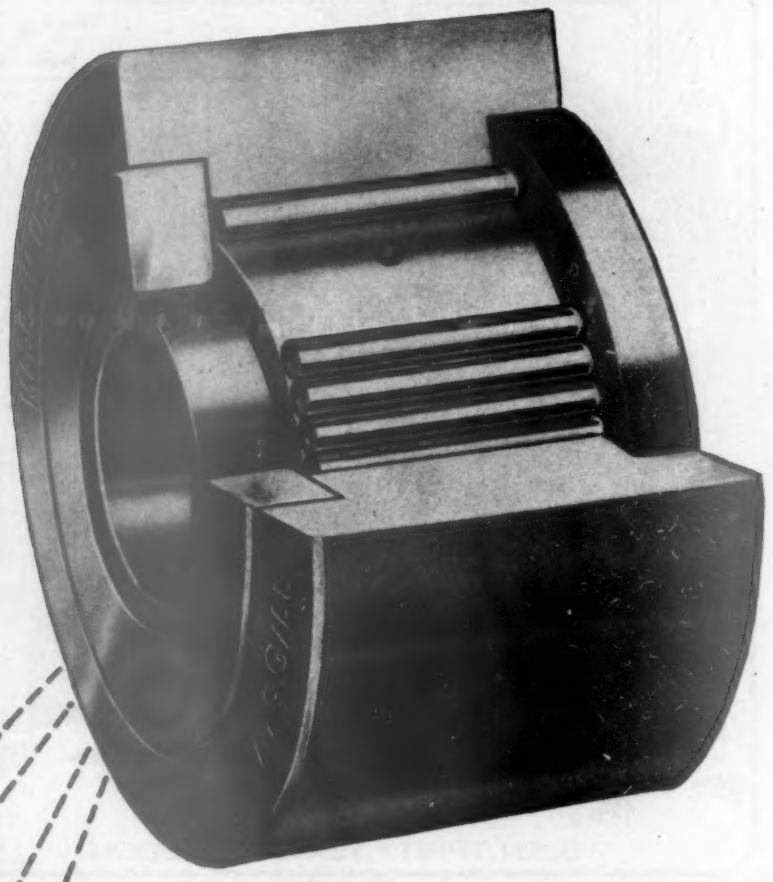
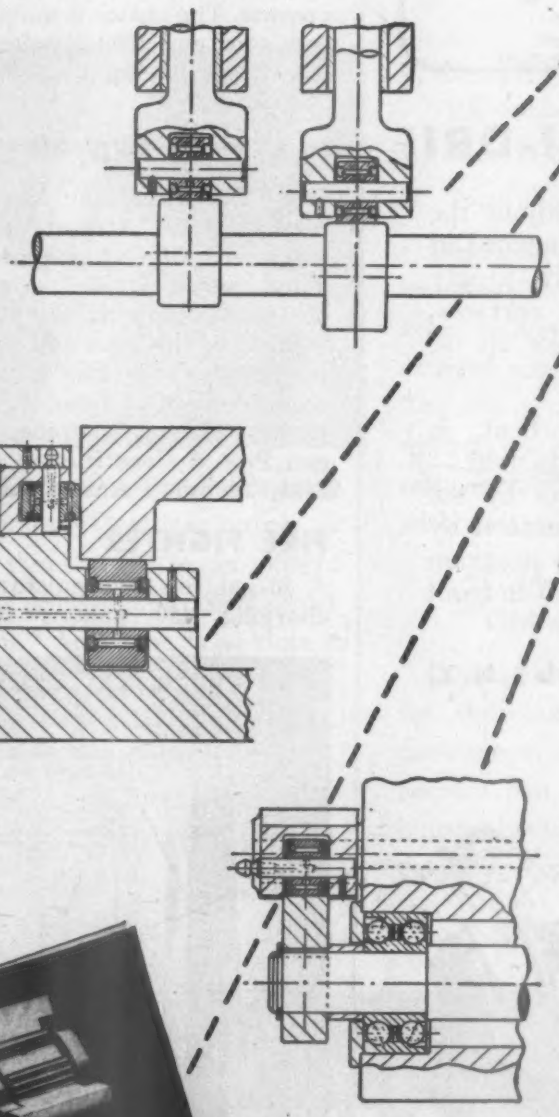
CAM YOKE ROLLER





McGill MULTIROL Cam Yoke Roller Bearings represent the latest development in full type roller bearings. The new CYR Series will provide greater adaptability of MULTIROL Cam Followers for all types of automatic machinery. They are specially suited for cam action or controlled motion of machine parts requiring guide or support rollers.

With an inner race replacing the usual stud, a full range of shaft sizes can be accommodated from .250 to 1.25 resulting in almost unlimited methods of mounting. The outer race sections are built extra heavy for shock load resistance and with the same internal construction as the MULTIROL Cam Follower Series. Send your problems to McGill Engineers, McGill Manufacturing Company, Inc., 301 North Lafayette Street, Valparaiso, Indiana.

Write for your free copy of Bulletin CY-47 on the new Multirol CYR Bearings.

McGILL precision bearings

IT HAPPENED *BEFORE* SOL-SPEEDI-DRI!

It's easy to date the situation in the cartoon above. Even without the old-fashioned clothes, you'd know that it happened *before* SOL-SPEEDI-DRI . . . the modern way to prevent slips and falls caused by oily, greasy floors. Just spread SOL-SPEEDI-DRI over dangerous, oil-slick surfaces, and you've got a slip-proof carpet underfoot — one that soaks up oil and grease and other liquids as a blotter soaks up ink.

SOL-SPEEDI-DRI, the field's original and foremost absorbent, is obtained by *selective* mining. Only the top-quality raw material is used — and this raw material is transformed into the finished product by the most modern equipment and methods. Peak efficiency is guaranteed by the fact that every ounce of SOL-SPEEDI-DRI is subjected to this program of quality control. That's the secret behind SOL-SPEEDI-DRI's out-in-front performance.

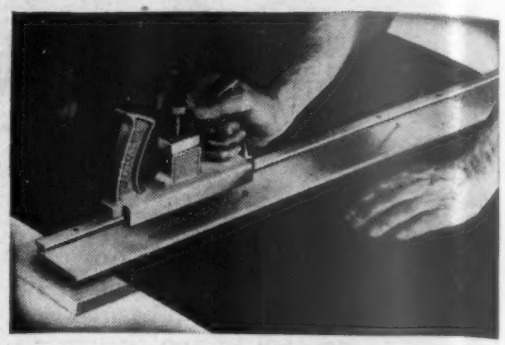
Safety and Maintenance Co., Inc., No. 1 Wall St., New York 5, N. Y.

Warehouse Stocks Maintained in Principal Cities of the United States and Canada

ing utensils, and for disinfecting floors, walls, furniture, towels, mops, and lavatories. One ounce is added to 4 or 5 gallons of water. Fairfield Laboratories, Plainfield, N. J.

BELT CUTTER

Belts up to 60 inches wide and 1⅛ inch thick can be cut by the No. 300 Alligator cutter. Made up of two elements—the head that carries the blade, and a



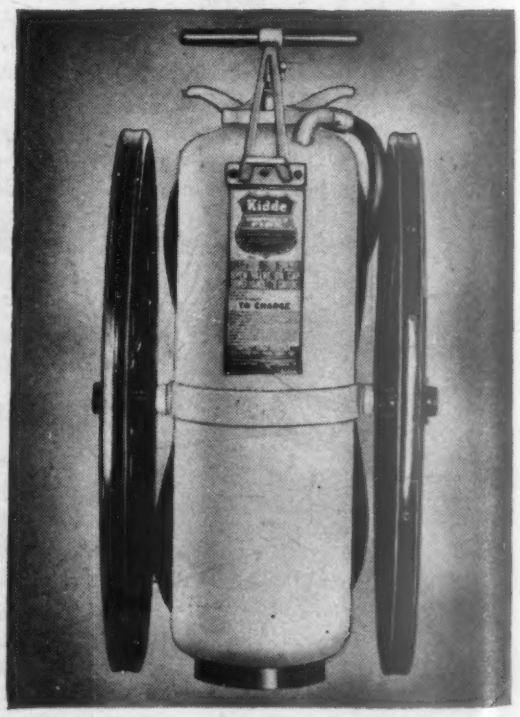
T-shaped base or guide rail. The blade consists of a long, thin, narrow strip of steel sharpened in a V shape. It is held in a slot in a vertical position in the head. A screw provides vertical adjustment. The base is made in four lengths, for 24-, 36-, 48-, and 60-inch belts. Each base is 4 inches longer than the width of belt on which it is designed to operate. The cutter is suitable for heavy conveyor and transmission belts. Flexible Steel Lacing Co., 4607 Lexington St., Chicago 44.

PLASTIC-LINED PIPE

Pipe for handling strong chemicals combines the structural strength of steel with the chemical resistance of Vinyl resins. Having a wall thickness of 0.05 to 0.06 inch, the plastic lining is bonded to the pipe and flared out over the flanges, providing a continuous corrosion-resistant liner throughout the piping system. Amercoat Div., American Pipe & Construction Co., P.O. Box 3428, Terminal Annex, Los Angeles 54.

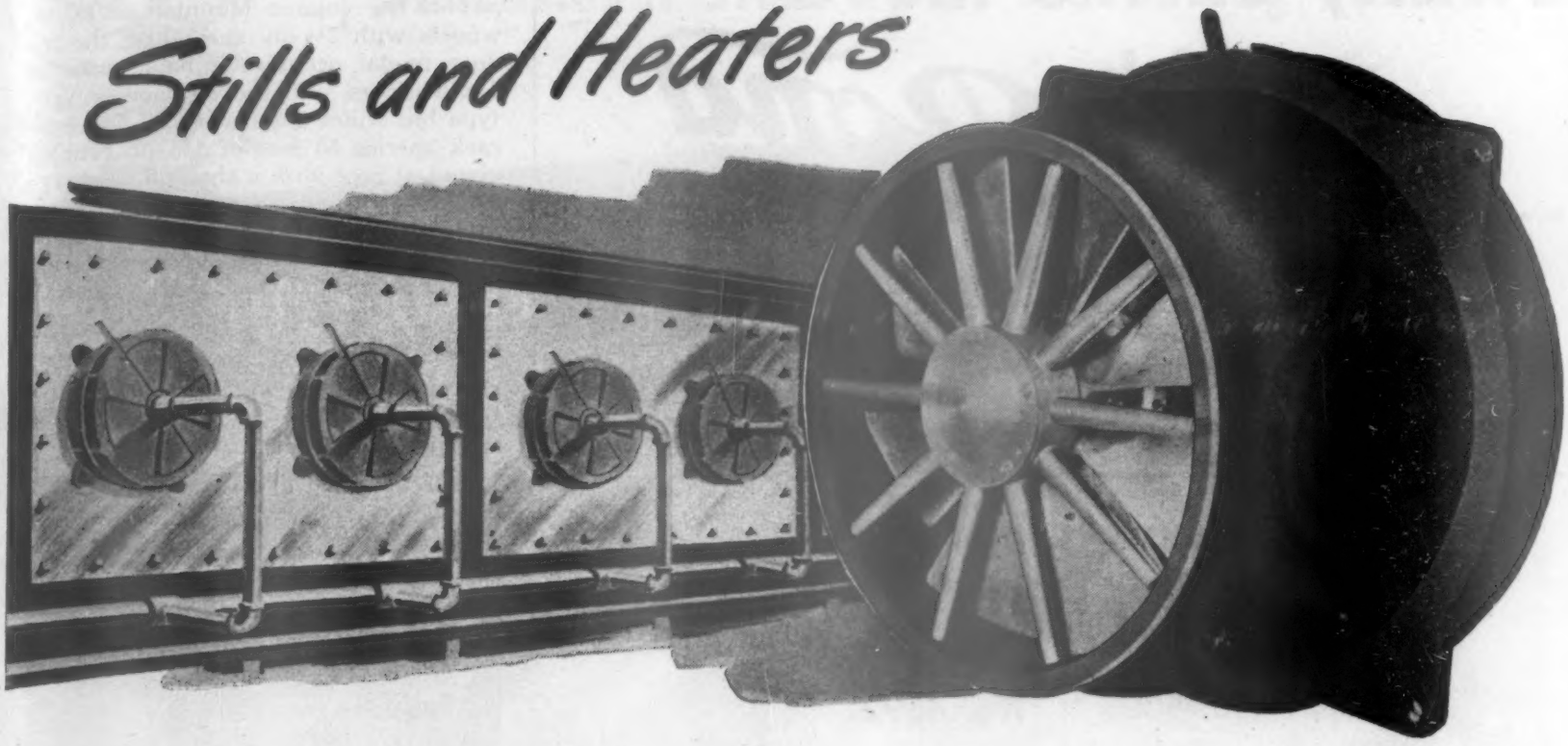
FIRE FIGHTER

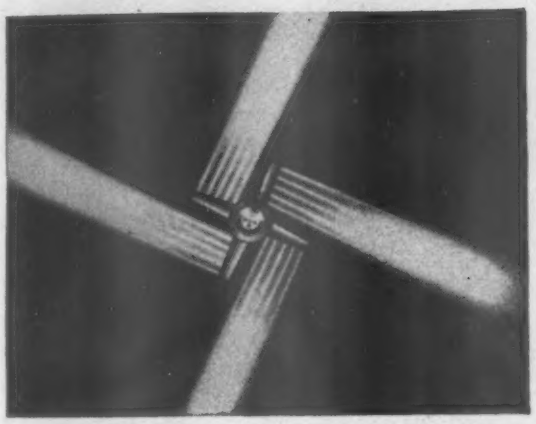
A 40-gal. fire extinguishing engine discharging 450 gallons of fire-killing



"BUNSEN'S DREAM" UPS THRU-PUT OF

Stills and Heaters





Bunsen, developer of the first gas burner, believed that "An ideal gas burner is one in which there would be an infinite number of gas orifices interposed across the air stream." And that is as close a description as you could get of the Coppus-Dennis FANMIX Burner.

The exclusive "pinwheel action" principle of FANMIX produces a perfectly combustible mixture of air and gas that results in:—

1. Complete combustion with less than 5% excess air.
2. Greater heat release.
3. Total absence of drifting "hot spots"

Here's how FANMIX works. Fuel escaping from orifices in rotating driver arms, rotates the fan which draws in air at right angles to the path of the fuel. The energy of the fuel under pressure is utilized to perform work by mechanically mixing and proportioning the fuel with just the required amount of air.

Increase Rating of Old or New Equipment

Coppus engineers FANMIX Burners for individual application. Complete control over rate of combustion or flame pattern can be provided to meet requirements of any installation. Straight gas and combination gas-oil burners available; combination burners burn either oil or gas in entirety or in any proportion. No oil guns needed.

Send for the Coppus-Dennis FANMIX Bulletin 410-4. Coppus Engineering Corporation, 186 Park Ave., Worcester 2, Mass. Sales offices in THOMAS' REGISTER. Other Coppus "Blue Ribbon" products in SWEET'S, CHEMICAL ENGINEERING CATALOG, REFINERY CATALOG.

On New Installations, Fanmix Saves

1. **COMBUSTION SPACE.** With FANMIX the furnace does not have to serve as a mixing chamber.
2. **STACK HEIGHT.** With FANMIX there is no draft loss across the burner.
3. **INSTALLATION COSTS.** With FANMIX you can use smaller pipe sizes, need no forced draft equipment, etc.

More than 93% of 191 petroleum refinery plants built for war, use Coppus equipment.

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

COPPUS ENGINEERING CORP.
112 Park Ave.,
Worcester 2, Mass.

FREE BULLETIN

Please send Bulletin 410-4 to

Name .....

Company .....

Address .....

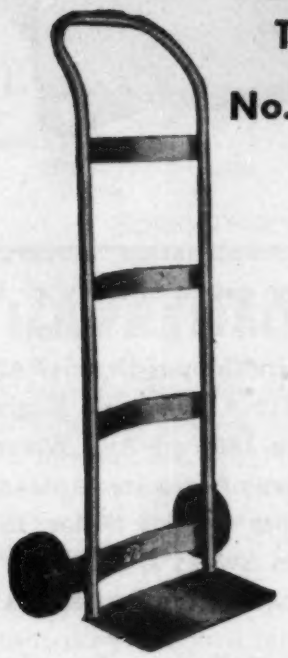
Keep Your Materials Swiftly on the Move with Bond

REG. U.S. PAT. OFF.

Bond Hand Trucks are the short cut to speedy, easy handling. They assure an unimpeded flow of materials to every point in your plant—keep your costs low. You can rely on a Bond to deliver the goods because Bond products have been noted for sound engineering for more than half a century. When you buy materials handling equipment, it pays to look for the Bond trademark. If it's a Bond, it's an asset.

BOND HI-BOY UTILITY TRUCK

No. 5005



You can pile your loads up to the top of the Bond Hi-Boy. Sturdy, light, easy to maneuver, it is particularly suitable for handling cases of beverages, cartons, cans and similar articles. Plain bearing or roller bearing solid rubber cushion tread wheels. Plain bearing wheels have self-lubricating bushings.

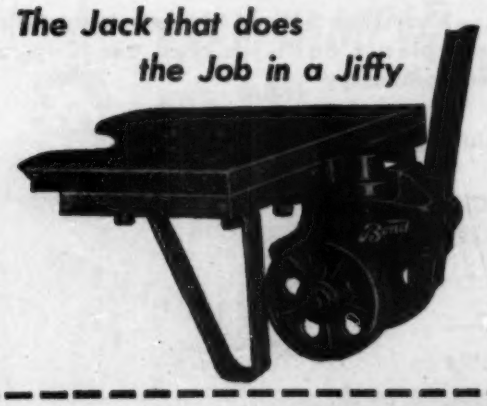
BOND KEG & CASE TRUCKS

No. 4691
No. 4692

No. 4691 is the truck with a thousand uses. No. 4692 is equipped with specially designed wheel guards for handling bags. Both of these husky, top notch trucks are made of 1" square high carbon steel tubing. Both are available with the following type wheels: plain or roller bearing semi-steel; plain or roller bearing vulcanized-on rubber.

BOND UNIVERSAL LIFT JACK

The Jack that does the Job in a Jiffy



You simplify handling of light and heavy loads with the Bond Universal Lift Jack. It is suitable for factory, foundry, terminal, loading dock, elevator or store. This jack is a cinch to operate. It couples and uncouples quickly, turns rapidly. Handle adjusts to operator's height. In close quarters, the Bond Universal Lift Jack is conveniently operated with handle in vertical position. You may store it upright in narrow areas. Safe—it won't drop and hit floor or lie underfoot and cause accidents.

Send for free folders describing in detail Bond Hand Trucks and Lift Jacks

Bond Foundry & Machine Co., Manheim, Pa.

foam will smother Class A fires (involving ordinary combustible materials) and Class B fires (flammable liquids). Metering control mixes solutions in measured quantities, increasing the output of the engine. Mounted on 50-in. wheels with 2½-in. steel tires, the indoor model occupies a floor space of 31x50 inches, and the outdoor or yard type has wider gage carriage. The hose rack carries 50 feet of 1¼-in. coupled chemical hose with a shut-off discharge nozzle. Finished in red enamel, they are approved by Underwriters' Laboratories and Factory Mutual Laboratories. Walter Kidde & Co., Inc., Belleville, N. J.

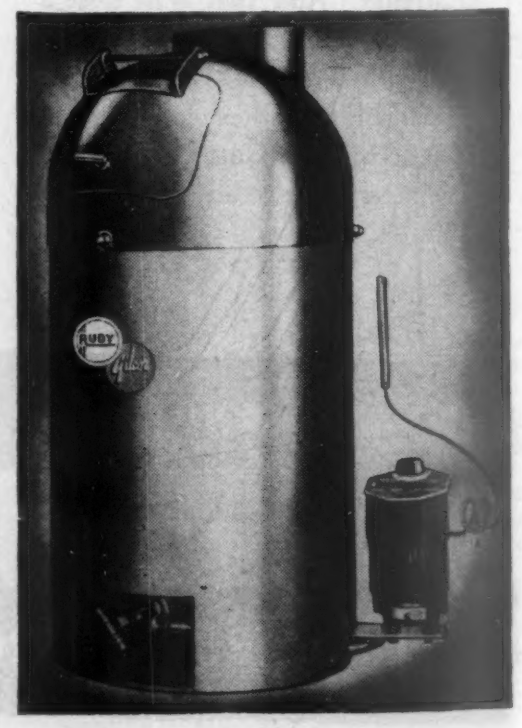
OIL FILTER

Proportional type oil filter of venturi design features a cartridge that filters out particles down to two microns in

size. Reversible filtering action is suitable for closed circuits. By-pass valve is not needed, because the venturi action controls maximum pressure built up across the cartridge. The filter can be installed in any horizontal hydraulic system pressure line. Vickers Inc., 1592 Oakman Blvd., Detroit.

WATER HEATER

The temperature of 55 gallons of water is said to be increased at the rate of 60



Strength at Freezing Temperatures, Dimensional Stability at the Boiling Point . . .

. . THEY'RE ALCOA ALUMINUM DIE CASTINGS

At low temperatures, Alcoa Aluminum Die Castings maintain, even improve, their tensile strength. There's no embrittlement to cause stressed parts to snap when very cold.

And at temperatures well above atmosphere, these lightweight die castings are dimensionally stable . . . hold to close limits . . . suffer no noticeable growth. There's no creep under sustained stress.

You also get the light weight of aluminum . . . only 40% as heavy as zinc and ⅓ as heavy as other common metals. Resistance to corrosion is high. And Alcoa Aluminum Die Castings have smooth surfaces that can be painted or finished without pretreatment.

Let us help you engineer Alcoa Aluminum Die Castings into the things you make or plan to make. They'll save you money on machining and assembly operations. ALUMINUM COMPANY OF AMERICA, 2126 Gulf Building, Pittsburgh 19, Pennsylvania. Sales offices in leading cities.

MORE PEOPLE WANT **MORE** ALUMINUM FOR **MORE** USES THAN EVER

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM

IMMEDIATELY POPULAR

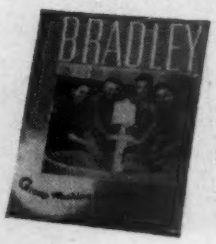
Bradley Postwar-Designed All-Metal Washfountains

The ultimate in modern, sanitary group-washing equipment, these durable enameled iron and stainless steel Bradley Washfountains merit their quickly won popularity. They fill the need for a highly sanitary fixture that is acid-resistant and capable of withstanding the severe abuse to which Washfountains in industrial plants or institutions are sometimes subjected.

Eight to ten people are accommodated simultaneously at the 54″ Washfountain thus making possible unusual savings in water consumption, space, maintenance and piping connections; also available in 36″ size. Distributed through plumbing wholesalers . . . BRADLEY WASHFOUNTAIN CO., 2215 West Michigan Street, Milwaukee 1, Wisconsin.

Write for Latest 4-color Catalog

New 24-page illustrated Catalog 4701 is now ready for distribution. Write for your copy today.



BRADLEY Washfountains

degrees in an hour by oil-fired boiler now on the market. Pilot flame, fuel cut-off, and temperature control are automatic. Rudy Furnace Co., Dowagiac, Michigan.

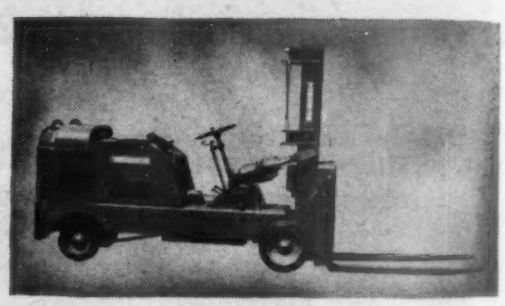
COLOR SLIDE PROJECTOR

Known as Spencer MK Delineascope, a 2x2-inch color slide projector is built in 150-, 200-, and 300-watt models,

with hard-coated optical surfaces. Features include a 5-inch focus f/3.75 achromatically corrected objective, said to give sharp image definition, and to transmit increased light; and a slide carrier which automatically centers glass, cardboard, or metal slides in the focal plane. No refocusing is necessary after adjustment has been made. The spiral focusing is claimed to be rapid and precise, and a heat-absorbing glass —plus fan cooling in the 300-watt model —assures slide safety. A doubly-protected lamphouse and ventilation system keep the projector cool enough to handle. American Optical Co., Southbridge, Mass.

FORK LIFT TRUCK

Lifting capacity of 15,000 pounds is the feature of fork lift truck Model LT-90. Similar in most respects to manufac-



turer's other fork lift truck models, it may be used in conjunction with the various accessories where special applications require them. Towmotor Corp., 1226 East 152nd St., Cleveland 10.

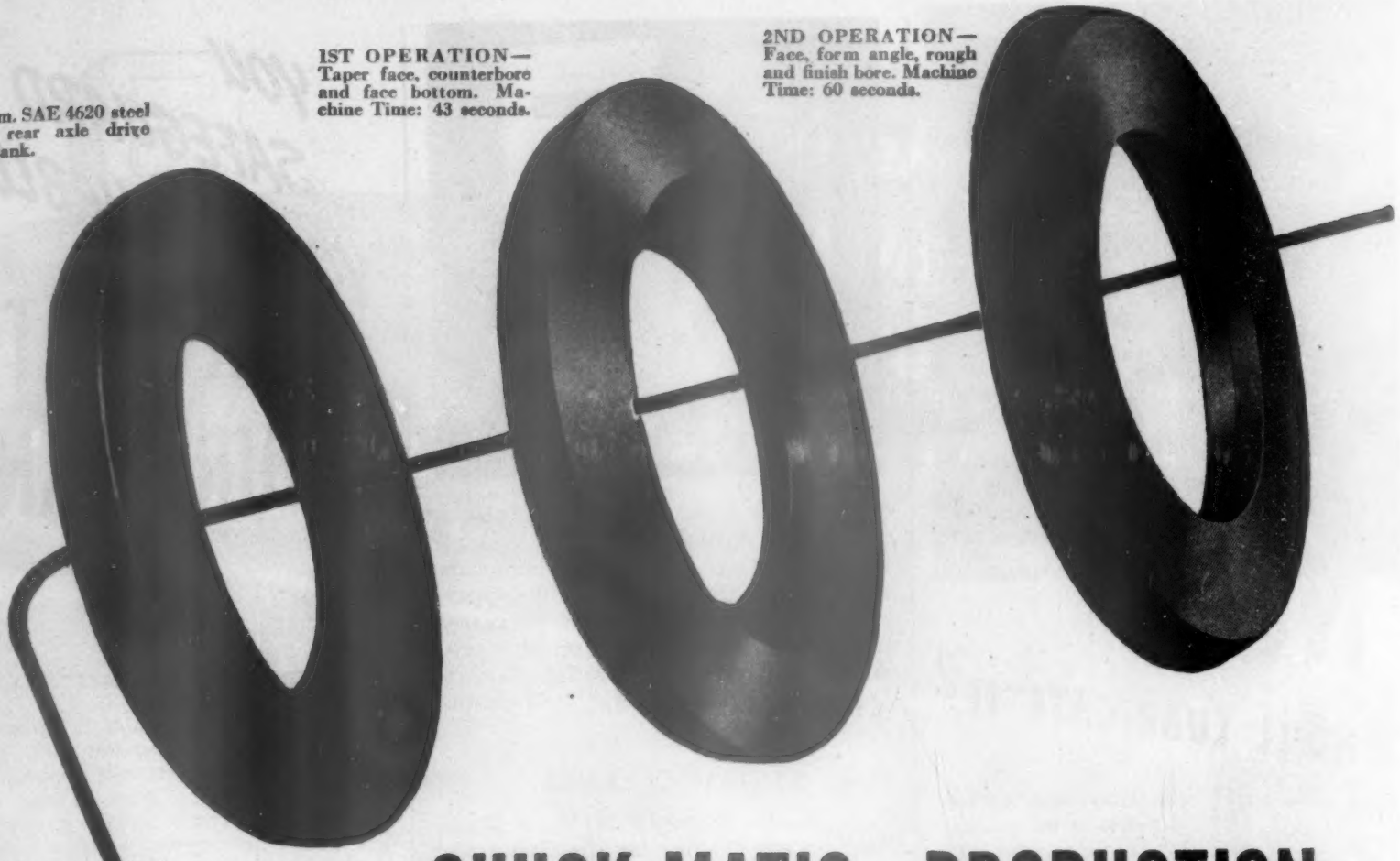
PHOTOELECTRIC CONTROL

Photo-Electric Scanner Model SC-301 is constructed for measurement or control of registration on printing, packaging, wrapping, or cutting machines. It consists of a lamp, concentrating lens, and a phototube. Obtains power from a control-amplifier with which it operates. For making connections to a remote control-amplifier, the unit is equipped with a 4-ft. shielded cable. Power requirements are 6 volts at 2.2 amperes a.c. or d.c. for lamp, and 90

8" Diam. SAE 4620 steel forged rear axle drive gear blank.

1ST OPERATION—Taper face, counterbore and face bottom. Machine Time: 43 seconds.

2ND OPERATION—Face, form angle, rough and finish bore. Machine Time: 60 seconds.



CHUCK-MATIC PRODUCTION

Two Operations—1 Min. 43 Sec.—Complete

For accurate, high-speed production of chucking jobs take a tip from this typical case study—one of many we can show you on the new Acme-Gridley 12" Chuck-Matic. It's built *rugged*—and *powerful*—to deliver speeds and feeds as fast as carbide-tipped tools can take it. It's built for *high production*—with a minimum of idle movement and plenty of accessibility for quick setups, easy loading, easy adjustment. It's built *compact*—for space saving. And because it's *easy to operate*, one operator (he needn't be highly skilled, either) can run as many as four machines. That's why we think you'll be interested in the complete details on the Chuck-Matic. Ask for bulletin SC-46.

Acme-Gridley 12" Single Spindle Chuck-Matic tooled for first operation on rear axle drive gear.

The NATIONAL ACME CO.

170 EAST 131st STREET • CLEVELAND 8, OHIO

Acme-Gridley Bar and Chucking Automatics: 1-4-6 and 8 Spindle • Hydraulic Thread Rolling Machines • Automatic Threading Dies and Taps • The Chronolog • Limit, Motor Starter and Control Station Switches • Solenoids Centrifuges • Contract Manufacturing

NOW

WHO'LL LUBRICATE IT?

The LUBRIPLATE Tag Service assures the machinery manufacturer, who uses LUBRIPLATE for initial lubrication, that the machines will be serviced with the same outstanding lubricant. Machine Builders, use the Tag Plan. Machine users, mail the post cards you find on the equipment.

℞ FOR YOUR MACHINERY

No. 2 — Ideal for general oil type lubrication, ring oiled bearings, wick feeds, sight feeds and bottle oilers.

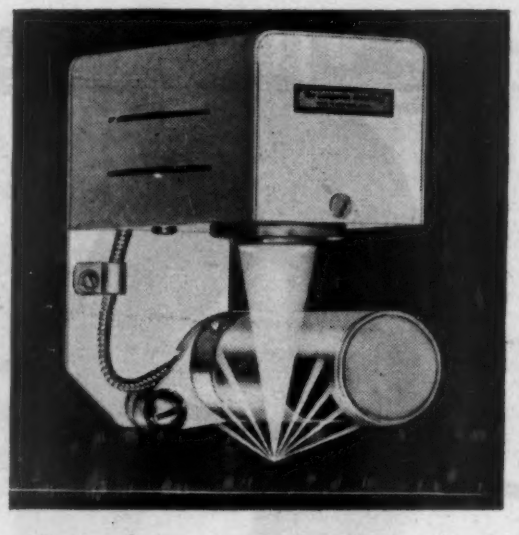
No. 8 — Because of high film strength and long life it reflects outstanding performance in most types of enclosed gears (speed reducers).

No. 107 — One of the most popular grease type products for general application by pressure gun or cups.

No. 70 — For a wide range of grease applications, especially at temperatures above 200 degrees F.

No. 130-AA — Known nationwide as the superior lubricant for open gears, heavy duty bearings, wire rope, etc.

BALL BEARING — This is the LUBRIPLATE Lubricant that has achieved wide acclaim for use in the general run of ball and roller bearings operating at speeds to 5000 RPM and temperatures up to 300 degrees F.



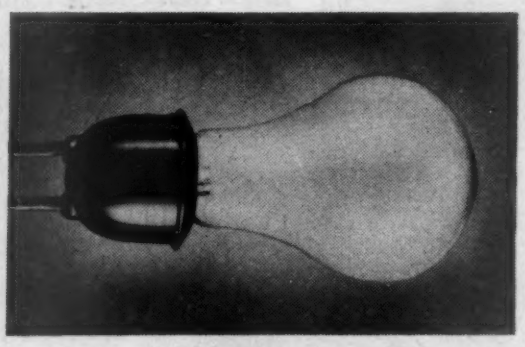
volts d.c. or peak a.c. for phototube. It is installed on machinery with a single stud mounting. Position of phototube and light beam are adjustable. Operates on either increased or decreased light, and with either red or blue sensitive phototube. Industrial Control Div., Langevin Mfg. Corp., 37 West 65th St., New York 23.

FUEL SYSTEM CLEANER

Tank Kleen Formula 101 is a liquid fuel system cleaner for dissolving and eliminating formations of gums, tars, and other hazardous binders that cause power stoppage. The non-corrosive gum solvent is applied either as a reconditioner or as a preventive, by pouring into the fuel tank. It is suitable for oil, gasoline, kerosene, or fuel oil systems. Dept. 101, Celco Corp., 110 East 42nd St., New York 17.

ELECTRIC LIGHT SOCKET

All-purpose electric light socket is said to be waterproof, weatherproof, and vaporproof. Designated Weatherproof Socket "350," it is sealed with neoprene, a crackproof, crushproof, elastic composition that is resistant to water, oil,



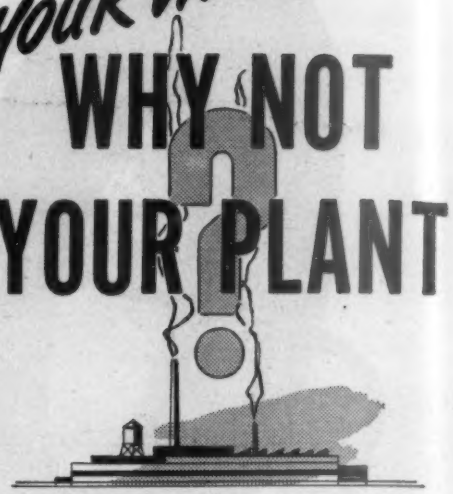
heat, and cold, maker states. The phosphor spring bronze contact of the socket is embedded in neoprene threads, while a moisture-tight lip of the matrial seals the globe, and the 6-in. pigtail outlets are molded into the neoprene base. No parts are exposed. May be obtained in individual units, or strung in sets of any length and any number of sockets, each socket wired independently. Neoline, Inc., 130 South Hewitt St., Los Angeles 12.

LAVATORY SEAT

Open-front lavatory seat is made of a plastic said to resist chipping and peeling. According to the manufacturer, it

YOU SAFEGUARD YOUR VALUABLES

WHY NOT YOUR PLANT



It can be quickly and effectively accomplished by surrounding your property with a Stewart Non-Climbable Chain Link Wire Fence. And you are assured of greater protection over a longer period of time because the Stewart exclusive Oval-Back, All-Beam fence framework is the heaviest and strongest manufactured. Before you buy, be sure to see what Stewart has to offer. Catalog No. 83, containing complete information, will be sent on request.

Stewart 3TH Chain Link Wire Fence. Also available in 5TH (5 strands of barbed wire).

STEWART WIRE MESH PARTITIONS

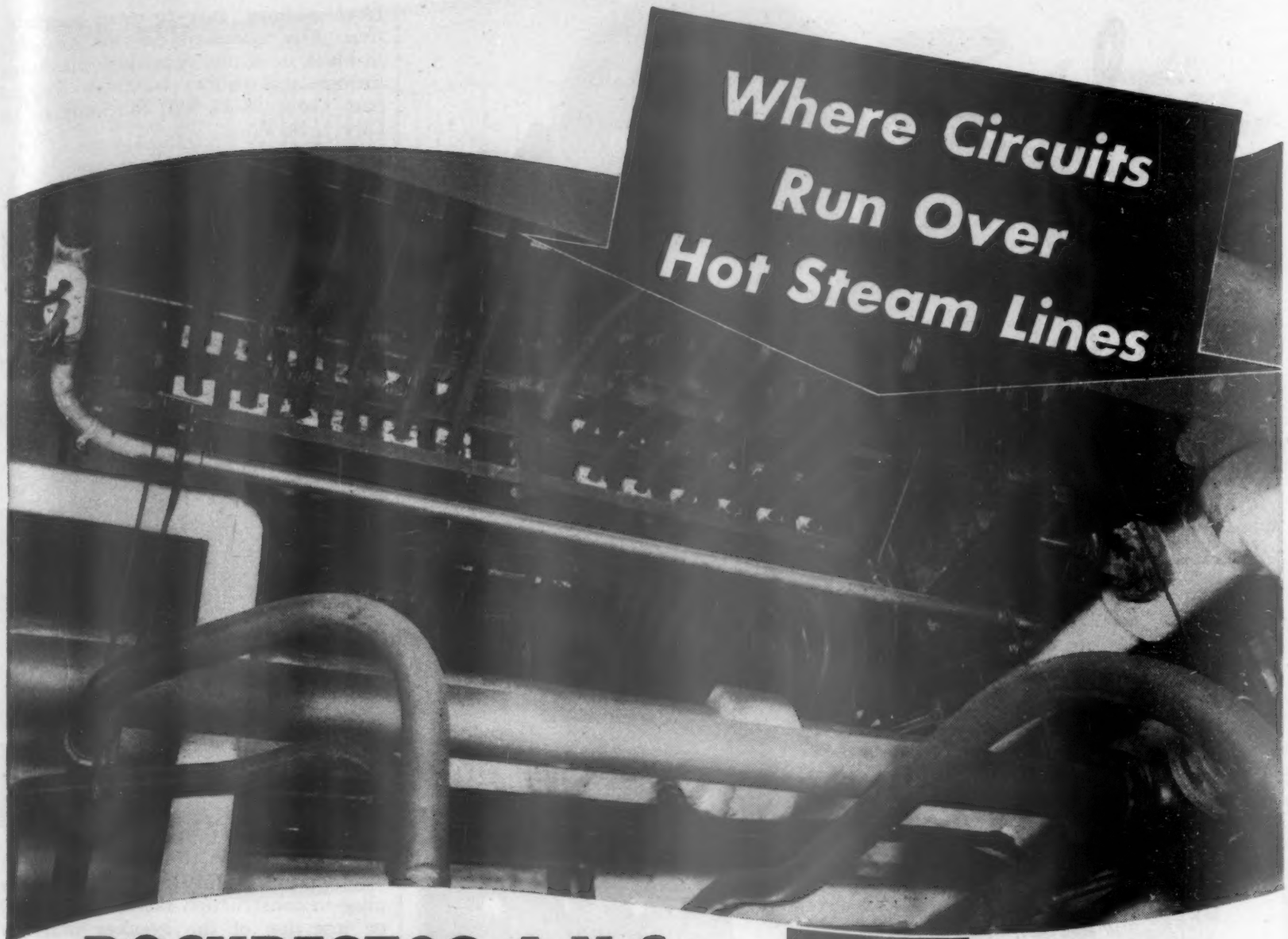
Sectional with standard panels. May be arranged to fit any space. Ideal for locker rooms, toolrooms, storage rooms.

Other Stewart Products: Iron Picket Fence and Gates; Iron and Wire Window Guards; Sliding and Folding Steel Gates; Iron Railings; Steel Settees; Skylight and Machinery Guards; Bronze Plaques, and many others. When writing for information, please mention products in which you are especially interested.

Stewart maintains sales and erection service in all principal cities.

THE STEWART IRON WORKS CO., INC.
1456 Stewart Block, Cincinnati 1, Ohio
"Fence Builders to America Since 1886"

Stewart IRON and WIRE FENCES



ROCKBESTOS A.V.C.

Gives Trouble-Free Performance in Temperatures up to 230°F.

The cables in the photo above have to take a continuous "Turkish Bath" day after day, month after month. They're getting a heat treatment that can cost plenty in rewiring and expensive maintenance unless the insulation is built *specifically* for such hot-spot installations.

It's in trouble-making locations like these that Rockbestos A.V.C. wires and cables protect vital circuits and reduce expense by giving *extra* years of service. Their *permanent* insulation outlasts other types because the impregnated asbestos withstands continuous operation under temperatures ranging up to a maximum of 230° F. Ample moisture resistance guards against failures caused by heating and cooling cycles in conduit installations. And the impregnated asbestos braid, like the insulation, won't deteriorate with age and won't rot or bloom when exposed to corrosive fumes, grease or oil.

Maintenance-reducing Rockbestos A.V.C. constructions in 600 to 5000 volt ratings include single and multi-conductor power cables, switchboard and lighting wires, control cables and other National Electrical Code types. Write for recommendations or samples.

ROCKBESTOS PRODUCTS CORPORATION
611 NICOLL ST., NEW HAVEN 4, CONN.

ROCKBESTOS A.V.C.

The Wire with Permanent Insulation

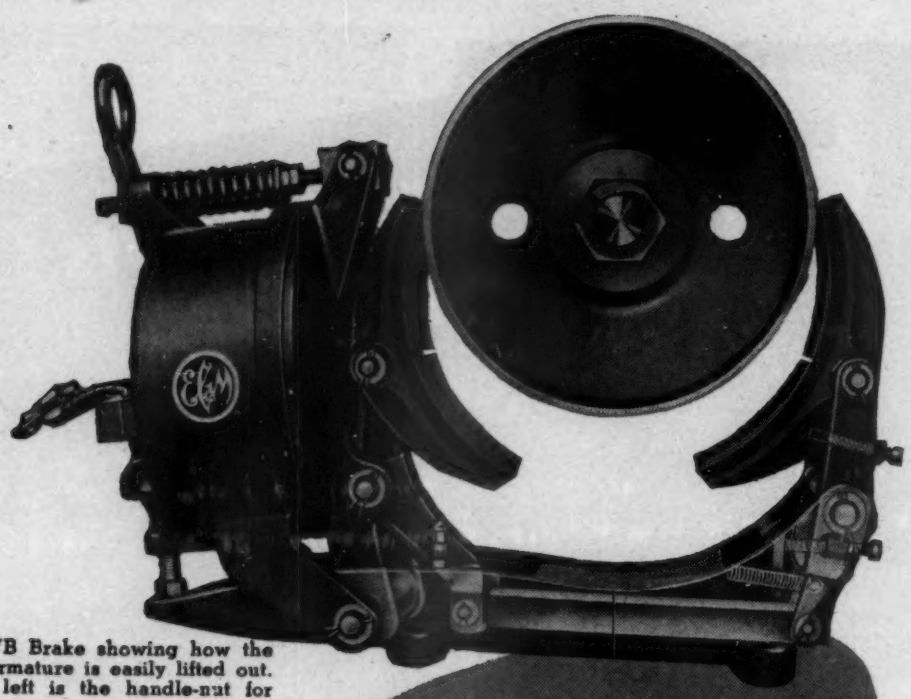
ROCKBESTOS A.V.C. 600 VOLT POWER CABLE—CODE TYPE AVA
(Max. operating temperature 230°F.)

The cable illustrated and similar types rated up to 5000 volts assure trouble-free performance in hot locations with this construction:

- A tough impregnated asbestos yarn braid, resistant to heat, flame, moisture, oil, grease and corrosive fumes.
- Heat, flame and moisture resistant impregnated felted asbestos outer insulating wall won't dry out, crack, flow or rot.
- Asbestos-protected varnished cambric for high dielectric strength and added moisture resistance.
- Inner wall of impregnated felted asbestos withstands conductor-heating overloads and won't bake brittle or burn.
- The conductor is perfectly and permanently centered in helically applied non-flowing insulation that helps provide greater current carrying capacity.

One of the 125 different wires, cables and cords designed by Rockbestos to meet severe or unusual operating conditions.

NEW YORK BUFFALO CLEVELAND DETROIT CHICAGO PITTSBURGH ST. LOUIS LOS ANGELES OAKLAND



Type WB Brake showing how the motor armature is easily lifted out. At top left is the handle-nut for compressing the spring when removing motor armature, changing brake shoes and for manual control.

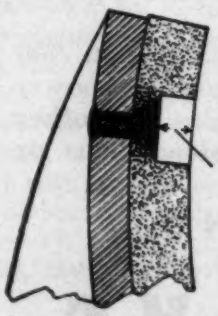
Long Life Brakes for A-C and D-C Motors by EC&M

The brake lining is molded to match curvature of wheel and shoe.

These Type WB Brakes for a.c. and d.c. service have a block type lining which is both thick and tough.

Furthermore, due to the process of manufacture, the blocks have proper frictional quality *throughout the entire thickness* permitting uniform and complete wear down to rivet heads. And since the material is non-compressionable, brake adjustments are infrequent.

EC&M Type WB Brakes are built in several sizes. They can be supplied with series or shunt-wound operating coils for direct current motors. On alternating current service, they are supplied in shunt-wound form for use with a compact rectifier-unit. Send for Bulletins 1004 and 1006 describing these long life brakes.



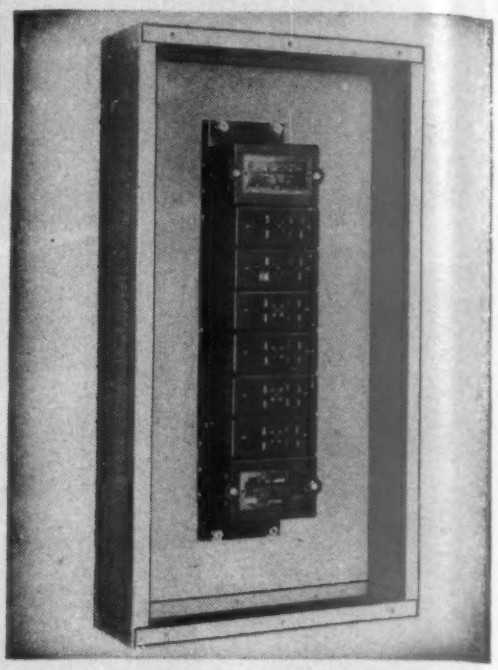
Actual wearing thickness, between rivet heads and brake wheel, is ⅛" on the smallest size to ½" on the largest size.

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79th STREET • CLEVELAND 4, OHIO

is of sanitary, easy-to-clean construction. Fits standard bowls. Available in black or white, furnished with brass fittings and rubber bumpers. Federal Seat Corp., 36-18 38th St., Long Island City 1, N. Y.

PANELBOARD

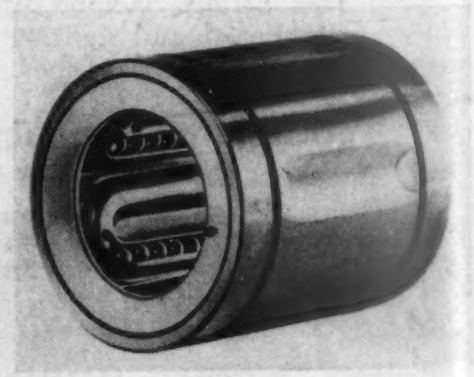
Increased gutter space—5½-in. gutters in 15-in.-wide panelboard—and added circuit capacity are featured in plug-in

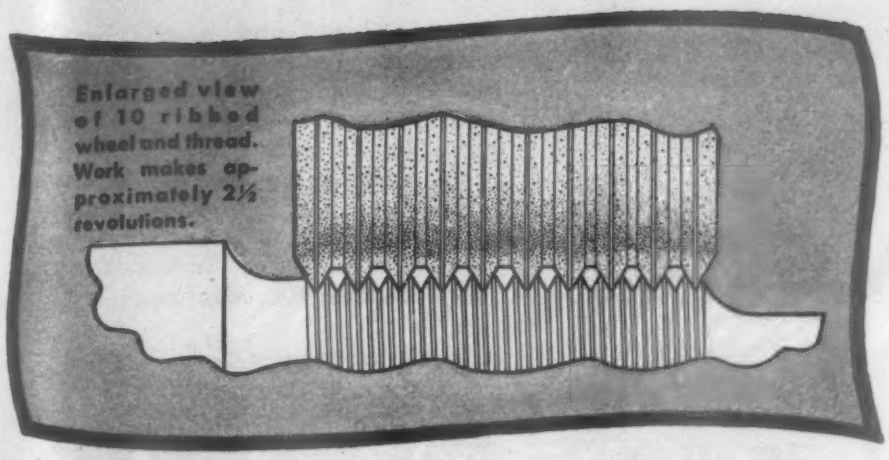


panelboard with thermal—(coilless) magnetic MO4 Multi-breakers. The plug-in construction facilitates removal or insertion of the breaker units for future changes in circuit ratings or for additional circuits. The breakers are mounted on silver-surfaced buss bars by means of positive-pressure contact jaws. The high-speed trip of the breaker is designed to give adequate time lag for starting motors and tungsten lamp inrush currents. The breaker units regularly provide four single poles that can be converted into two double poles by inserting handle ties. The panelboards are furnished in 100- and 200-ampere main circuit ratings, 120/240-volt a.c., with 15-, 20-, and 30-ampere branch circuits. Square D Co., 6060 Rivard St., Detroit 11.

LINEAR BALL BEARING

Unlimited-travel, anti-friction ball bearing is built for linear or reciprocating motion. Called "Series A" Ball Bushing, it is a self-contained unit with three basic parts in addition to the balls: a sleeve made of 52100 ball-bearing

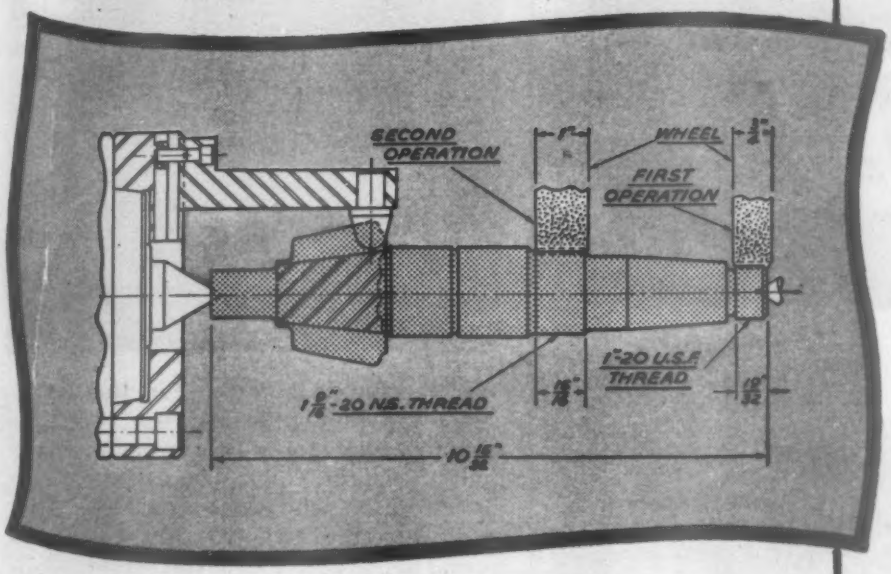




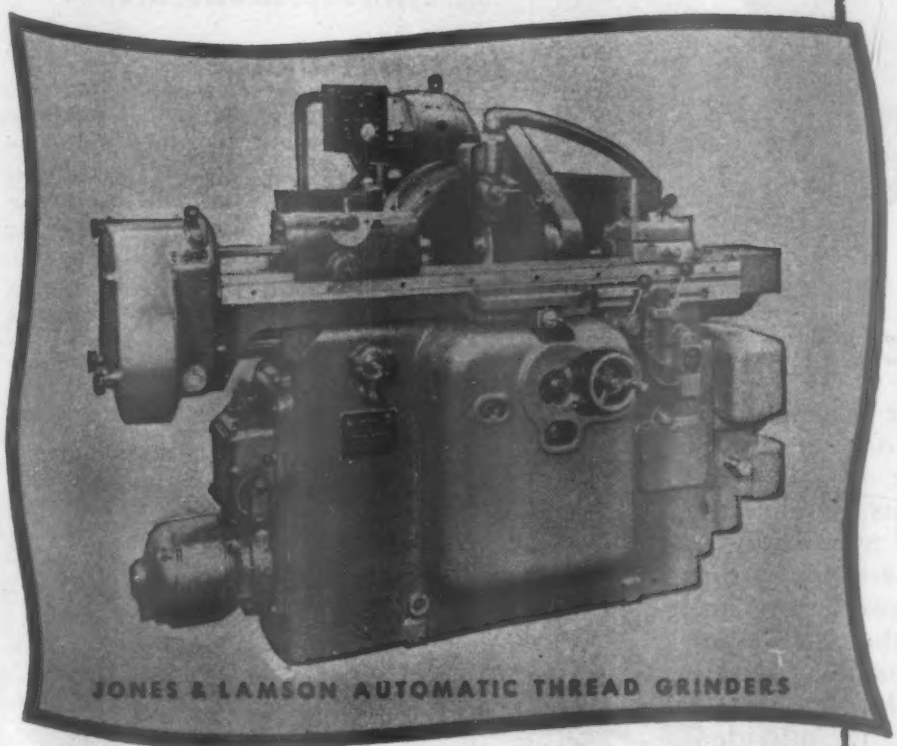
HERE'S *Production* THREAD GRINDING . . .

Ground from the Solid in *15 seconds*

1"—20 N.S. THREAD, GROUND FROM THE SOLID



ON AXLE DRIVE PINIONS



"PRODUCES NEAR PERFECT THREAD"

"EXPENSIVE HAND DIE OPERATIONS ELIMINATED"

"NO MARRED THREADS ON THE ASSEMBLY LINE"

"WHEEL COST PER PIECE LESS THAN THREAD HOB AND CHASER COST"

The Timken Detroit Axle Company, prominent manufacturer of heavy truck axles, has this to say about a Jones & Lamson Automatic Multi-Ribbed Thread Grinder installed to grind the threads on axle drive pinions.

"The threads are machined as a last operation following heat treat and grinding of all bearing diameters and prior to lapping. The machine produces a near perfect thread and eliminates all expensive hand die operations along the line and overcomes marred thread on the assembly line".

". . . the grinding of threads also reduces direct labor costs and indirect cost of cutting tools and equipment".

Jones & Lamson Automatic Multi-Ribbed Thread Grinders offer remarkable opportunities for economy with better quality in the mass production of threaded parts. Ask for one of our engineers to tell you more about multi-ribbed production thread grinding.

JONES & LAMSON MACHINE COMPANY, Springfield, Vermont, U. S. A.

Manufacturer of *Automatic Thread Grinders* and Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers • Ground Thread Flat Rolling Dies

MAXIMUM

FUEL SAVINGS

WITH...

BARBER-COLMAN

Econostat

The ECONOSTAT is applicable to all types of heating systems in factories, and in commercial, industrial, and office buildings.

Installation is simple, requiring only the cycling control unit shown here and a motor-operated valve on the principal main or a switch on the burner. For zoned system, a separate installation is usually used on each zone.

IMPROVES HEATING ECONOMY

This efficient, durable, and highly flexible instrument is designed to control the operation of a motor driven valve (with central steam plant heat supply) or an oil or gas burner or stoker (where the building has its own heating system) so as to regulate the heating of a building in accordance with changes in outdoor temperature by supplying heat at intervals. It will avoid overheating and maintain more uniform temperature — thus achieving maximum fuel savings. Simple adjustments cover length of cycle, operating range, calibration, night temperature depression, and morning warm-up to suit individual building conditions.

Write for Bulletin F-1647-2

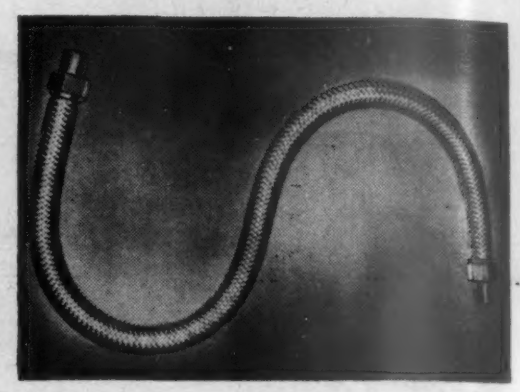
BARBER-COLMAN COMPANY

1202 ROCK STREET • ROCKFORD, ILLINOIS

steel, hardened and ground to close tolerances; a pressed steel retainer fabricated in long continuous strips, cut off and rolled up to fit inside the sleeve; and a pair of rings pressed in the ends of the sleeve to position and secure the retainer to the sleeve. Available for shafts having ¼-, ½-, ¾-, and 1-in. diameter. Thomson Industries, Inc., 1029 Plandome Rd., Manhasset, N. Y.

FLEXIBLE TUBING

Made with inconel inner core and braid, flexible tubing may be supplied for temperatures up to 1700 deg. F. The inner core of inconel tubing has 0.005- to 0.015-in. wall thicknesses. The thicker



wall tubing is suitable for the larger sizes for high-pressure use, and the thinner wall for lower pressure and lighter weight. Construction is resistant to vibration and corrosion. The hose may be supplied with flat ribbon or round wire braid. The flat braid is applicable for higher pressures and resistance to wear, particularly to sizes of 1 inch or more. Titeflex, Inc., 505 Frelinghuysen Ave., Newark, N. J.

MASONRY DRILL

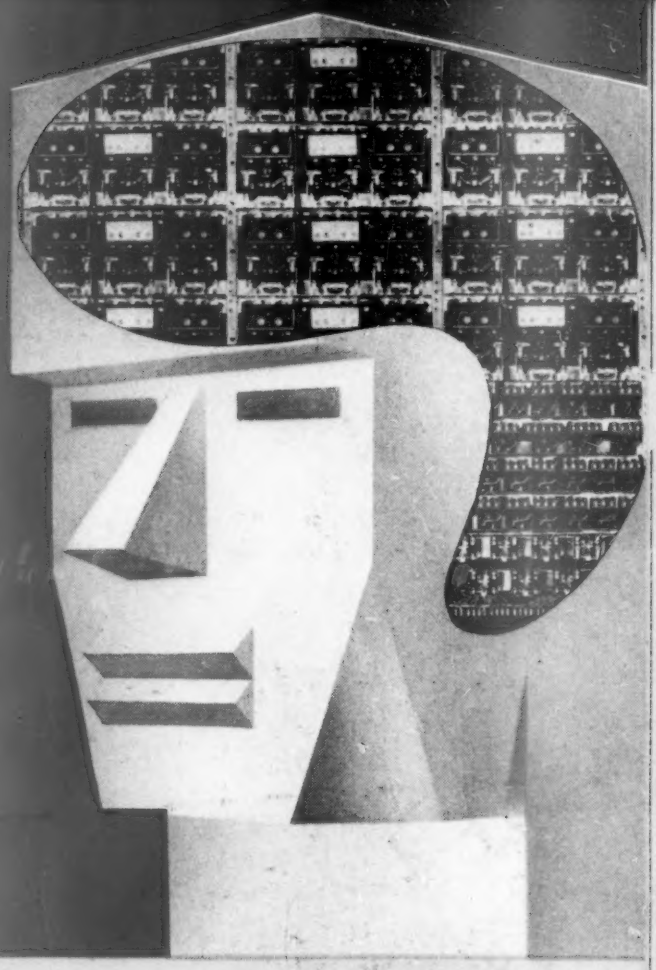
Used with any electric drill, a masonry drill bit works with a rotary pulverizing action to form straight, clean holes, maker announces. The drills are available in 1/16-in. sizes from ½- to 1½-in. diameters. Diamond-type cutting tips are said to increase boring speed and to lengthen life. It is claimed

that 3 inches of concrete can be drilled in less than 50 seconds with a ½-inch drill. Concrete Termite Sales Co., 2301 Main St., Santa Monica, Calif.

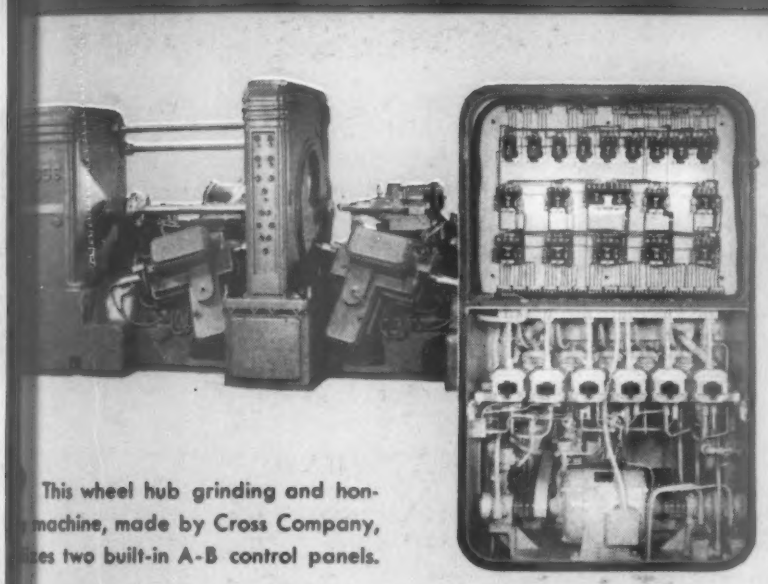
ELECTRIC HOIST

Line of Speedway electric hoists, built in capacities of 250 to 2000 pounds, incorporates a grooved drum which accommodates a full 12-ft. lift without

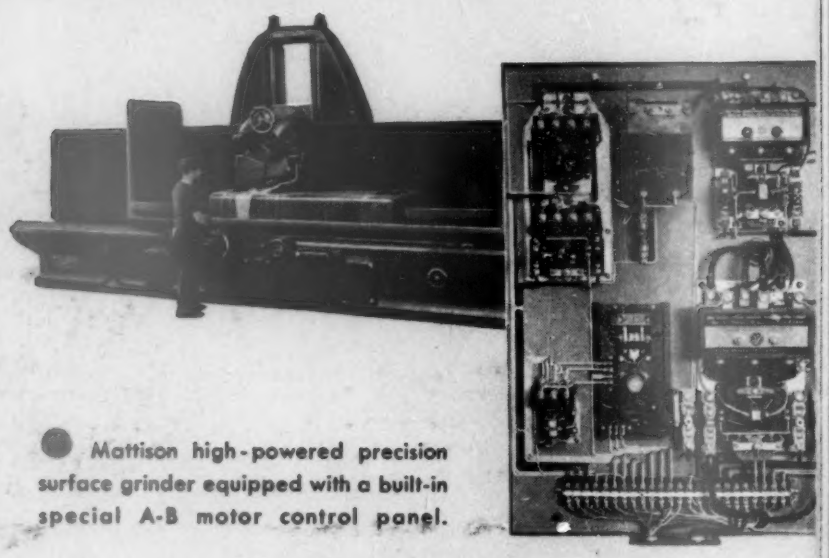
Install a Modern "Electric Brain" on Your Machines



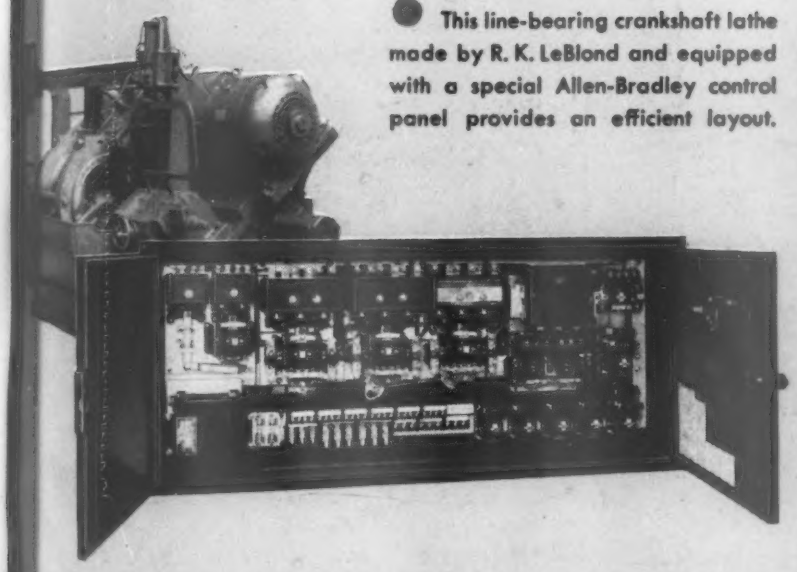
The "Electric Brain" of the modern machine is the motor control panel. Simply push a button and the electric controls provide the correct automatic sequence of operation—it speeds operations and minimizes errors. Allen-Bradley engineers will gladly study your control problems—usually the answer can be found in an assembly of standard control units. Write today!



This wheel hub grinding and honing machine, made by Cross Company, uses two built-in A-B control panels.



● Mattison high-powered precision surface grinder equipped with a built-in special A-B motor control panel.



● This line-bearing crankshaft lathe made by R. K. LeBlond and equipped with a special Allen-Bradley control panel provides an efficient layout.

● Rotary milling machine, made the Cross Company, has an A-B mo control panel built into the mach base. Note its clean, neat appearar

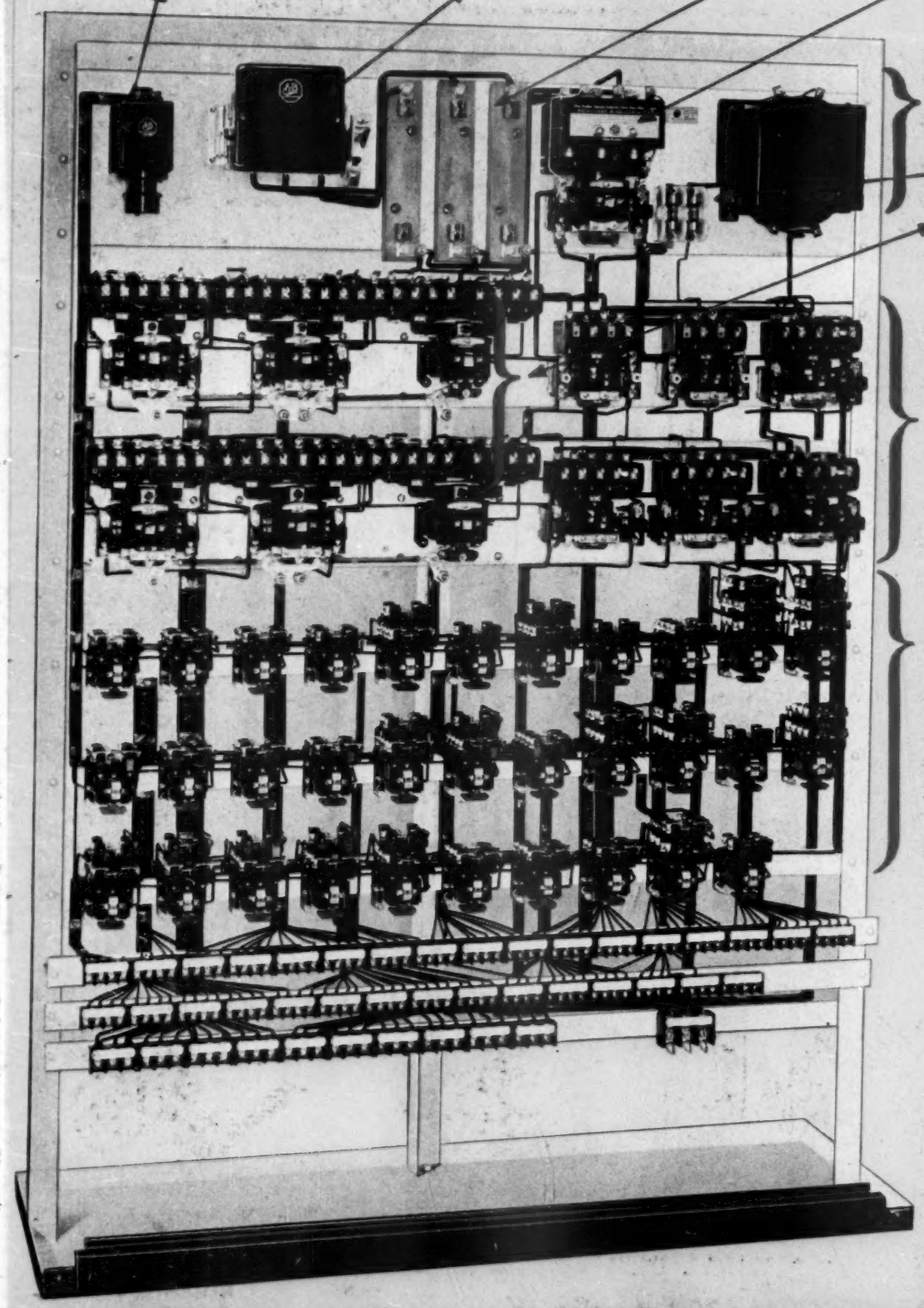
SEE OTHER SIDE

A-B Quality

Let ALLEN-BRADLEY QUALITY design your Special

Special Control Panels

Built from Standard Solenoid Control Units



Bulletin 849 Timing Relay
A reliable, adjustable relay for the accurate timing of sequencing operations.

Disconnect Switch
Has quick make and quick break contact action. Double break, silver alloy contacts assure trouble-free operation.

Main Line Fuse Clips

Bulletin 709 Across-the-Line Starter

The Size 2 solenoid starter is compact, simple, a trouble-free. Two thermal overload relays protect t motor from damage due to sustained overloads.

Step-Down Transformer

The 440 volt line voltage is reduced to 110 volts f operation of push button and pilot control stations— added "safety" feature for the operator.

Pilot Circuit Fuses

Bulletin 715 Multispeed Starters

These two solenoid starters control two-speed, con quent-pole, constant-torque motors, and provide f reversing at high speed. They consist of three mecha ically interlocked magnetic contactors with therm overload protection. Double break, silver alloy contac

Bulletin 709 Across-the-Line Starters

The Size 1, Bulletin 709 solenoid starting switch insulated from its metal base plate and can be mount directly to any metal frame structure. Totally enclos contacts prevent all possibility of arc flashovers a also permit close grouping of starters and contacto

Bulletin 700 Solenoid Relays

These solenoid type relays are good for millions operations. They have no bearings, pivots, or pins bind and cause trouble and are remarkably consiste in operating speed. Available in from one to twe poles, in many types, for practically any voltage.

● This special motor control panel was bu for The Sommer and Adams Company for special automatic machine tool for drillin and tapping axle shafts. All of the units use on this panel are standard items from th Allen-Bradley line. These control units ar only a few of the many standard Allen Bradley solenoid type switches which can b used for the construction of special motor con trol panels. All have double break, silver allo contacts which require no contact mainte nance. Write for complete information.

Allen-Bradley Co., 1316 S. Second St.
Milwaukee 4, Wisconsin

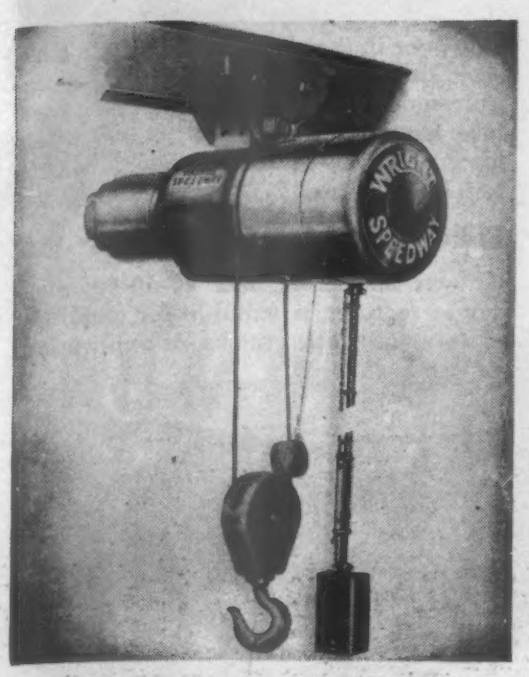
SEE OTHER SIDE

A-B Quality

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

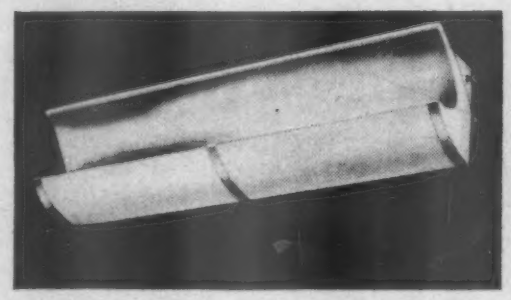
QUALITY



overwinding. Equipped with pushbutton control, preformed wire rope with swaged fittings for anchoring, Timken tapered roller-bearing trolleys, and standard NEMA motor frames and ratings. The hoist is furnished with lug, hook, or trolley suspension, as required. When with trolleys, hoist is provided with pull-chain and handle. Wright Hoist Div., American Chain & Cable Co., Inc., York, Pa.

GERMICIDAL FIXTURES

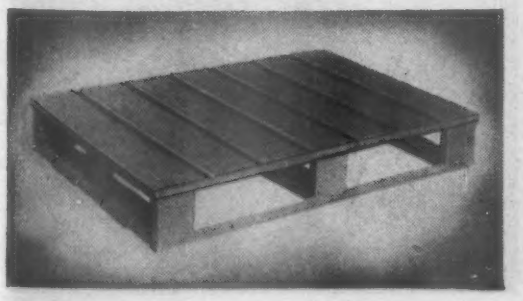
Claimed to destroy airborne bacteria in as little as 8 seconds, germicidal unit is made in two types. One model is built to kill airborne bacteria through indirect radiation, and the second to destroy molds, bacteria virus, and fungus through direct radiation on surfaces and



in liquids. Used indirectly and mounted above eye level, the fixtures can be used in the plant and cafeteria. Made in two lengths—15 watts in 18 inches, and 30 watts in 36 inches—the lamps have rated life of 4000 hours in 3-hour cycles. Duro Test Corp., North Bergen, N. J.

FOUR-WAY PALLET

Four-way, single-face, all-steel pallet, for use with power lift and hand trucks, is constructed of corrugated rolled steel, welded throughout. Built with beveled edges on two sides to permit trucks to



city of
NORWICH
CONNECTICUT
now
uses

Full engine powered for
MAXIMUM
TRACTION

All-Purpose
GARDENAID
Tractors
and
saves
saves
saves

COSTS Uses as little as a gallon of gas a day — whether it's mowing lawns — cutting tall grass — or removing piles of snow.

TIME Largest implements of any tractor its size means Gardenaid covers more ground in less time.

LABOR Operator simply guides—Gardenaid does the work. With 50% greater gear reduction and a simple implement hitch — Gardenaid directs more power to the ground than any tractor its size.

Contact your Gardenaid dealer for a demonstration of MAXIMUM TRACTION IN ACTION on your property.

These BIGGER IMPLEMENTS make the difference!

(Snow Plow)

(Trac-Mower)

(Cutter Bar)

WHEREVER SNOW FALLS — do as many cities do—use Gardenaid's 4-FOOT SNOW PLOW-GRADER for top performance.

WHEREVER GRASS GROWS — as on your property lawns — use Gardenaid's 48" CUTTER-BAR and the new Gardenaid 24" TRAC-MOWER.

ASSOCIATION OF GARDENAID USERS INCLUDE . . .

Motor Freight
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For more information and FREE literature write
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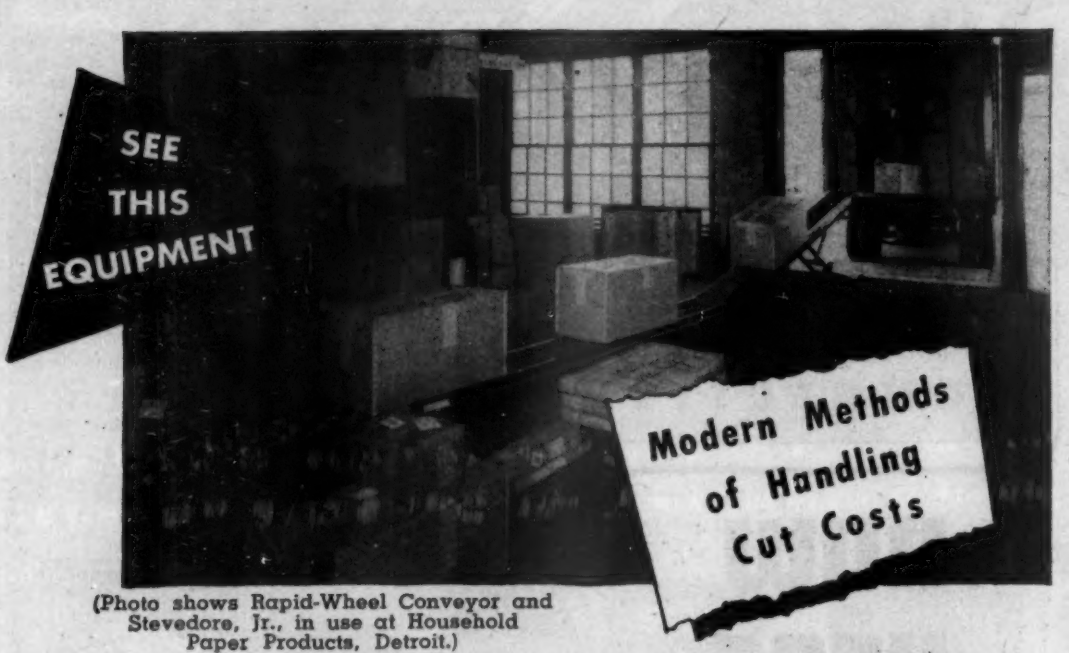
KINGSTON, N. Y.



(Photo shows Rapid-Wheel Conveyor and Stevedore, Jr., in use at Household Paper Products, Detroit.)

RAPIDS-STANDARD HAS THE LATEST IN

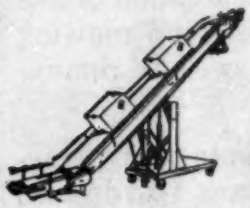
Handling Equipment

During the past few years great strides have been made in improving handling methods for all types of industry. It has become increasingly apparent that the easiest and most profitable way to INCREASE PRODUCTION is to reduce handling time. . . . For surveys show that material handling accounts for 30% of the time and 20% or more of the cost in producing any item.

Rapids-Standard makes QUALITY products . . . gravity wheel and roller conveyors, permanent and portable power belt conveyors, hand trucks, floor trucks and casters. Their use will reduce handling time and increase production.

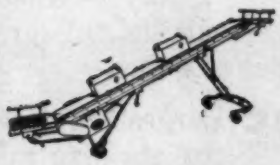
You can see this modern handling equipment as it is being used in applications similar to your own. We will be glad to have our local representative make arrangements for you to see how this equipment can cut your costs and increase your production. Why not write for complete data today?

AVAILABLE NOW



RAPID POWER BOOSTER

Portable endless belt conveyor having many uses in lifting, stacking, carrying. Adjustable for height and angle of incline.

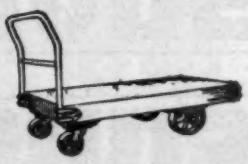


STEVEDORE, Jr.

Sturdy endless belt conveyor. Portable — easily moved by one man . . . or can be permanently installed.

RAPID-WHEEL CONVEYOR

Portable Gravity conveyor. Extra strong, easily handled. 5′ to 10′ sections with many accessories. (Rapid-Roller also available.)



FLOOR TRUCKS

Modern floor trucks for greater handling efficiency. Rugged construction, free running action. Wide choice of wheels.

YOU CAN'T MISS
when you Conveyorize
with
RAPIDS-STANDARD
Modern Handling Equipment

Offices in principal cities throughout the country.

Manufacturers of
STEEL FORGED CASTERS - TRUCKS - CONVEYORS - POWER BOOSTERS

The Rapids-Standard Co., Inc.

Sales Division — 370 Peoples National Bank Bldg., Grand Rapids 2, Mich.

ride over it, the pallets are made in gage, size, or weight capacity to meet requirements. The rolled channel steel face has center brace for extra-weight loads. Palmer-Shile Co., 16007 Fullerton Ave., Detroit 27.

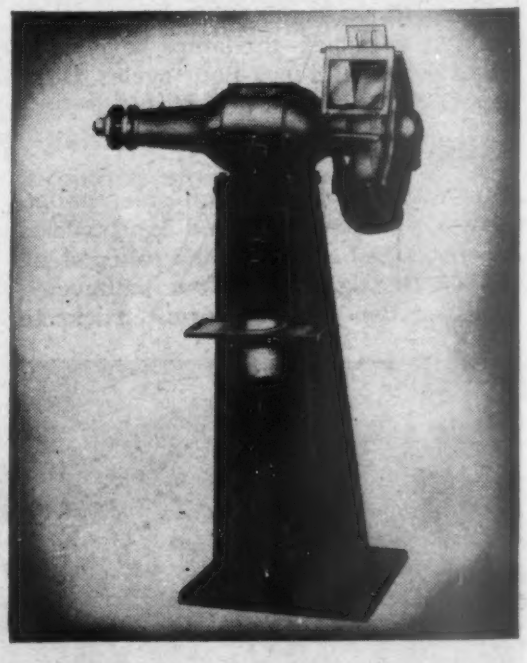
ELECTRONIC RECTIFIER

Known as Series WR 40-50-60, electronic rectifier is suitable for small d.c. motors, magnetic chucks, or applications

where d.c. power from 750 to 2000 watts is required. Voltage is 115/230 d.c., 115/230/460 a.c. The unit features increased ventilation, accessibility to parts, and simplified design. The control panel tilts forward for servicing. Mounted on the front panel are the main line switch, line fuses, and time-delay relay which prevents operation of the power tubes until the filaments are properly heated. On the back of the control panel are mounted the two power tubes and terminal strip where all connections are made. A red light on the door shows when the unit is energized. Available in other power ranges. Weltronic Co., Dept. K, 19452 West 8 Mile Rd., Detroit 19.

GRINDERS AND BUFFERS

Bench- and pedestal-type grinders and buffer-polishers, known as the "190" series, are equipped with 1-hp., 110-220-volt, 50/60-cycle, single-phase motors. Suitable for job requirements of maintenance departments, eleven tool models make up the series. Model 190, a double-wheel pedestal grinder, and 191, a combination grinder and buffer on a pedes-



THE TRUMBULL ELECTRIC MANUFACTURING COMPANY

PLAINVILLE, CONNECTICUT

OTHER FACTORIES AT NORWOOD, OHIO • SAN FRANCISCO • SEATTLE • NORTH HOLLYWOOD

with **DARNELL CASTERS**

YOU CAN *Save Money*

If you want maximum floor protection, economy and efficiency Demand Darnell Dependability...Made to give an extra long life of satisfactory service.....

Write...

FOR NEW DARNELL MANUAL

THERE'S A **DARNELL CASTER & E-Z ROLL WHEEL** FOR EVERY INDUSTRIAL USE---

DARNELL CORP. LTD. 60 WALKER ST. NEW YORK 13 N.Y.
LONG BEACH 4 CALIFORNIA 36 N. CLINTON CHICAGO 6 ILL.

tal mount, have 12-in. wheel diameters. Model 192 is a 2-ball-bearing pedestal buffer, having 23½-in. distance between wheels. Of the four-ball-bearing pedestal buffers, Model 193 has 31-in. distance between wheels, Model 194 has 39-inches, and 195, a low-stand-type, has 31 inches between wheels. The Bradford Machine Tool Co., 657 Evans St., Cincinnati 4.

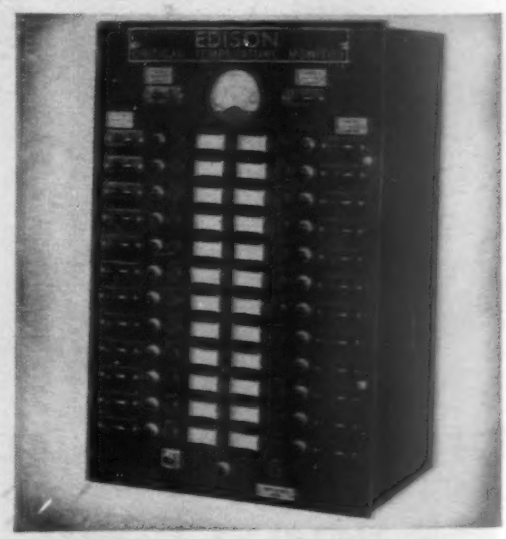
INTERCOMMUNICATORS

Three intercommunications systems are announced. One, a "packaged" 2-way

master and remote station system, with tubes and 50 feet of cable, is suitable for 2-way conversations. Another is a master-and-5-remote-station hook-up. Permits the master station to talk to one, several, or all remote stations at the same time, through a selective switch control. Remote stations can call to the master. The third is an all-master system that connects up to six master stations. Conversation is possible between any two masters, all masters, or any combination of masters desired. Mark Simpson Mfg. Co., Inc., 32-28 49th St., Long Island City, N. Y.

BEARING TEMPERATURE CONTROL

Up to 24 bearings can be covered by an automatic monitoring system which sounds an alarm when bearings start overheating. An electrical resistance bulb, .215-inch in diameter, is mounted in a small hole drilled in each bearing. If bearing temperature exceeds an established maximum, an alarm is sounded, and the overheated bearing is identified by an indicating lamp on the central control cabinet panel. Temperature of



Another New Britain Automatic with

initial and permanent accuracy

A NEW LINE OF PRECISION CONTOUR TURNING AND BORING MACHINES

Accurate and Fast — Cam and Air Actuated

Featuring

1. An endless variety of contours or combinations may be generated with a single-point tool. Besides all the regular jobs of straight precision boring and turning, facing and chamfering, it will produce lands, recesses, flanges, steps, counterbores, and radii.

2. A disc type cam for each table gives positive action consistently throughout the day — from the first to the last piece — uninfluenced by temperature changes.

3. Through positive cam action, tool approaches on rapid traverse to within .005 of the work and immediately starts to feed. Tool may cut on feed-in or drawback stroke, or both for rough and finish cuts. On return stroke, tool jumps clear eliminating drag off marks. When moving between intermittent or successive cuts, tool goes into rapid traverse

4. Uniform temperature, anti-friction bearings, and super-precision spindles provide spindle speeds up to 7,500 RPM. Mechanical precision chucking operated by air cylinders. Neither chucking nor unchucking operation affects preload or position of spindle bearings.

5. Only one dimension need be inspected on any one set-up, regardless of the number of diameters produced by any one single-point tool Cams control and positively repeat from piece to piece.

6. Set-up of machine depends entirely upon nature of job. Work may be rotated in spindles or mounted on table, loaded from the front of the spindle or through the spindle. Spindles may be raised, lowered, or separated. Two spindles are standard, but more may be added. Changing job set-up simply requires replacing two cams, setting tool for size and changing chucks.

THREE OTHER NEW MACHINES

Latest additions to the New Britain line include: The new, faster, more powerful line of automatic screw machines designed to make the most of carbides on long and short runs, the Model 365, tool rotating, double end chucking machine — and the new line of automatic turret lathes.

THE NEW BRITAIN MACHINE CO. NB

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

That's a challenging statement to make . . . but we invite your attention to the comparisons listed below. The reason for this labor-asset which Oklahoma offers manufacturers seeking new plant locations is . . . efficiency! From intelligent native-white workers, adaptable to factory-type operations you get more man hours of production.

	Value of Manufactured Product Per Wage Earner	Production Yield Per Wage Dollar
Oklahoma	$11,104	$10.24
Indiana	8,389	6.45
Michigan	8,326	5.50
Illinois	8,034	6.39
Ohio	7,661	5.64
New York	7,448	6.12
Pennsylvania	6,379	5.45
Massachusetts	5,339	4.91
Connecticut	5,265	4.45

Source: U. S. Census, 1939.

Send for this book of information which describes graphically twelve basic factors favoring business and industry in Oklahoma. A special confidential survey report relating to your own business will be prepared on request.

IN THE SOUTHWEST
YOU CAN DO BUSINESS BETTER FROM THE CENTER

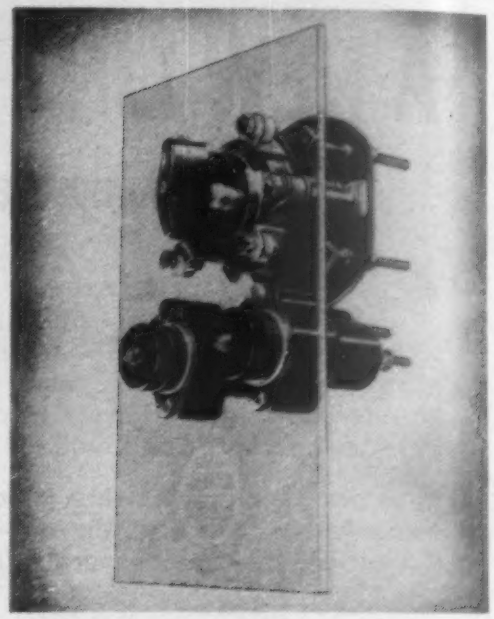
OKLAHOMA

PLANNING and RESOURCES BOARD
STATE CAPITOL BUILDING
OKLAHOMA CITY, OKLAHOMA

any bearing can be read on an electric thermometer in the panel. A modification of the system sounds an alarm at one established temperature, and automatically shuts down the machine if a second, and higher, established temperature is reached. Facilities are also provided for checking and testing all circuits and alarms. Instrument Div., Thomas A. Edison, Inc., 52 Lakeside Ave., West Orange, N. J.

FUSED ROTARY SNAP SWITCH

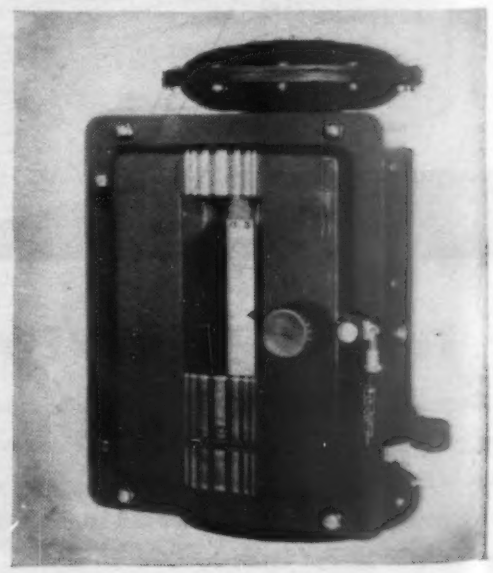
Said to save space in switchboard installation, fused switch is horizontally



mounted. Comprises Type P high-speed, rotary quick make-and-break snap-action switch combined with panel-mounted fuse holders. The holders accommodate standard cartridge fuses in the 10-, 30-, 60-, 100-, and 200-ampere ratings in which the switch is available. Fuse holder includes a neon lamp-type blown fuse indicator, and provides for replacing fuses from panel front. Electro Switch Corp., Weymouth, Mass.

AIR-FUEL REGULATOR

Air-fuel ratio controller, for large industrial furnaces, employs electric-motored valve drives, needs no hydraulic piping. The instrument is said to have ample flexibility to meet any operating condition. Ratio can be adjusted manually for operation with fuels of various B.t.u. content. As fuel flow changes, the



Why shut down to move one machine?

DO YOU reach for red ink when machines must be moved? Do you watch production take a dive because a whole line must be shut down to tap in one machine? And do you wince at the cost of rewiring to change a shop set-up?

Then check with BullDog BUStribution DUCT for plug-in power that covers your whole plant.

Every ten-foot section of this modern electrical feeder system has ten convenient outlets. When a machine is moved the electrician need only raise the plug to the nearest outlet, snap its contact fingers over the bus bars and bolt the plug to the casing. He can do the whole job in twelve minutes or less.

A single machine, or a dozen, can be relocated with no delays for new wiring . . . no interruption of power for the rest of the line.

Built in standardized, prefabricated sections, BullDog BUStribution DUCT can be dismantled, moved and re-installed in new locations or combinations without scrapping a single bolt.

Call your nearby BullDog Field Engineer for full information on this flexible, economical power system, or write BullDog direct for descriptive folders.

ACCURATE WIRING SERVES SAVES

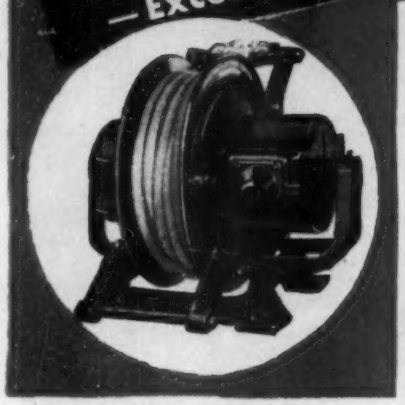
BULLDOG

ELECTRIC PRODUCTS COMPANY

BullDog manufactures Vacu-Break Safety Switches — SafToFuse Panelboards — Superba and Rocker Type Lighting Panels — Switchboards — Circuit Master Breakers — "Lo-X" Feeder BUStribution DUCT — "Plug-in" Type BUStribution DUCT—Universal Trol-E-Duct for flexible lighting—Industrial Trol-E-Duct for portable tools, cranes, hoists.

DETROIT 32, MICHIGAN. FIELD OFFICES IN ALL PRINCIPAL CITIES. IN CANADA: BULLDOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO.

Stop Losses
DUE TO CONDUCTOR CABLE FAILURE



CONSTANT DUTY

APPLETON REELITE

TRADE MARK

- Ball bearings eliminate wear—give lifetime of trouble-free use.
- Dust-tight, grease-filled clock-spring chamber—needs no maintenance or further attention.
- Rachet clutch eliminates spring breakage.
- Adjustable cable outlets.

No costly time losses or cable repairs with Appleton Reelites because the cable is held gently taut—excess is reeled up out of the way—no chance for tangles, kinks, or breaks! Electrical current is kept constantly, smoothly supplied to moving machinery.

Over 23,000 of these automatic cable tenders are now working with maximum efficiency and economy on all types of electrical machinery from portable hand drills to electrical lifting magnets, hoists, chargers, motor generator sets and cranes. Their sturdy construction (cast of heavy, durable material) is giving a lifetime of trouble-free reeling and hard usage.

Appleton Reelites will serve you profitably, too. So start *now* on your plan to lower maintenance costs. Write today for 50-page bulletin giving complete information.

Send Today!

For Bulletin No. 504 on Appleton Reelites. Complete information on Constant Duty, Portable, and special types. Or see Sweet's File, page 2a/22.

APPLETON ELECTRIC COMPANY
1715 WELLINGTON AVE. • CHICAGO 13, ILL.

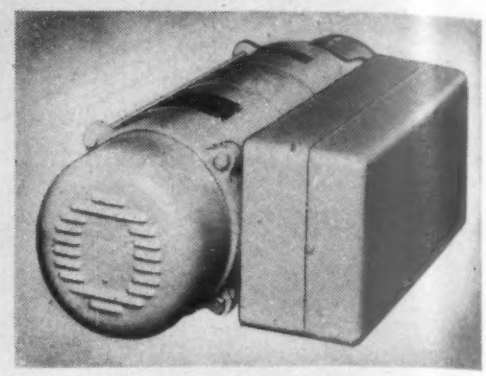
14 Branch Offices and 7 Resident Representatives in all principal markets.

APPLETON
CONDUIT FITTINGS • OUTLET AND SWITCH BOXES • EXPLOSION-PROOF FITTINGS • REELITES

regulator maintains air-fuel ratio constant at the desired control point. Or it can provide automatic variation of ratio, increasing or decreasing the per cent of air at reduced fuel flows. Mounts on the furnace panel. Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44.

MOTOR CONTROL

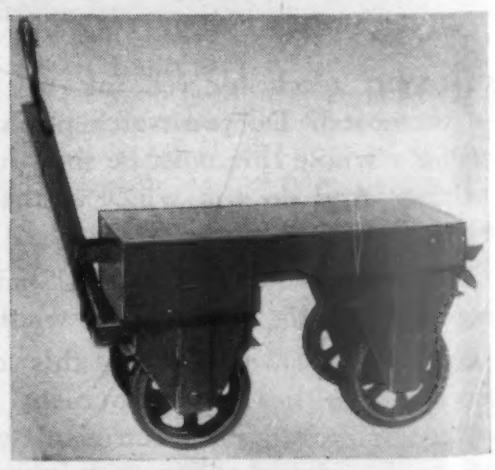
Electronic amplidyne consists of a high-gain balanced d.c. electronic amplifier and a motor amplidyne. The high-



capacity amplifier is constructed for motor control where precise regulation of current, voltage, and speed is necessary. Used as a regulated adjustable-voltage power supply for d.c. motors up to 1½ horsepower, and as a regulated exciter for larger adjustable-voltage drives up to 200 horsepower, the equipment has 1½-kw., 250-volt output. It is arranged for use on either a 220- or 440-volt, 3-phase, 60-cycle power supply. The electronic amplidyne permits a speed range of 20 to 1 or greater, and is adaptable to programming and processing control. The amplifier is insensitive to line voltage changes. Motor Div., General Electric Co., Schenectady 5.

DIE TRUCK

Heavy dies, stampings, forgings, jigs, or fixtures can be transported in the plant on truck constructed of heavy steel plate. Roller conveyors can be put on the bed of the truck to facilitate handling materials. Welded throughout, the truck is furnished with four rubber-tired or



metal wheels equipped with Timkin tapered roller bearings, and a fifth wheel or caster with Timkin thrust bearings. Made in any size or capacity. Palmer-Shile Co., 16007 Fullerton Ave., Detroit.

PORTABLE AIR DRILL

Air-operated rock drill, designated J-10 Utility Jackhammer, for construction and maintenance work, and general util-

"WE RECOMMEND CIRCLE Ⓑ BOLTS"

● Factory Managers and Purchasing Agents who have had experience with Circle Ⓑ Bolts never hesitate to recommend them when requested. They know how important the dependable size and strength of these bolts are in the efficient assembly and future performance of their products.

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Export Sales Office: Buffalo International Corp., 50 Church Street, New York City

"KEX" Industrial Wiping TOWELS

Are better helpers!

And Here's WHY—

1. KEX Industrial Wiping Towels are made specifically for wiping ... They're soft-textured, uniform in size ... have no forgotten buttons or hidden abrasives *whatever,* to mar delicate, expensive surfaces.

2. They are *safer* to use because bound edges eliminate ragged ends from catching in machinery.

3. You can order them on a rental basis ... delivered at any time convenient to you—at *regular* intervals.

4. They come to you counted in neat, easily stored bundles that help you control distribution.

5. *Every* KEX Industrial Towel has been chemically cleaned and is individually inspected before it is sent to you.

No wonder KEX Industrial Towels are used by many of the nation's leading manufacturing plants. These companies have found them more efficient, more economical and *safer* than ordinary rags.

Rent KEX Industrial Wiping Towels and figure your savings! Nothing to buy—no expensive inventory—just a low monthly rental. The first month you use this service should show a decided saving on wiping costs.

For complete information, see your classified Telephone Directory for nearest KEX distributor, or write KEX National Service, 295 Fifth Avenue, New York 16, New York.

"KEX" NATIONAL SERVICE

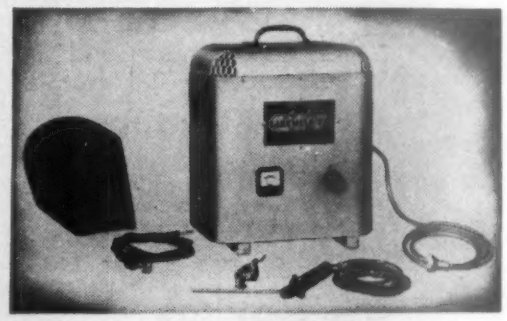
REG. U.S. PAT. OFF.

"KEX" REG. U.S. PAT. OFF. NATIONAL SERVICE A CALLAWAY MILLS PRODUCT INDUSTRIAL WIPING CLOTHS

ity, can be used on a ladder or scaffold, and is suited to over-head work. Has automatic rotation, and utilizes standard Jackbits. With adapters, star drills can be used to drill holes 1⅛ inch and under. It can be used as a light paving breaker, or for chiseling and channelling, by removing the rotation pawls or using round shanked tools. A built-in oil reservoir in the handle supplies lubrication. Throttled control permits the selection of the required blow for any type of work or tool. Ingersoll-Rand Co., 11 Broadway, New York 4.

COMBINATION BATTERY CHARGER-WELDER

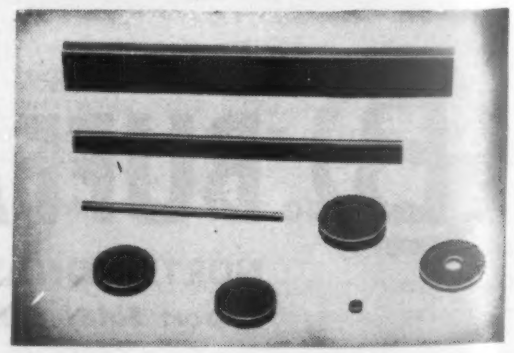
Battery charger and arc welder are combined in a portable unit made in two models. The Larkweld 77 is a 30-ampere



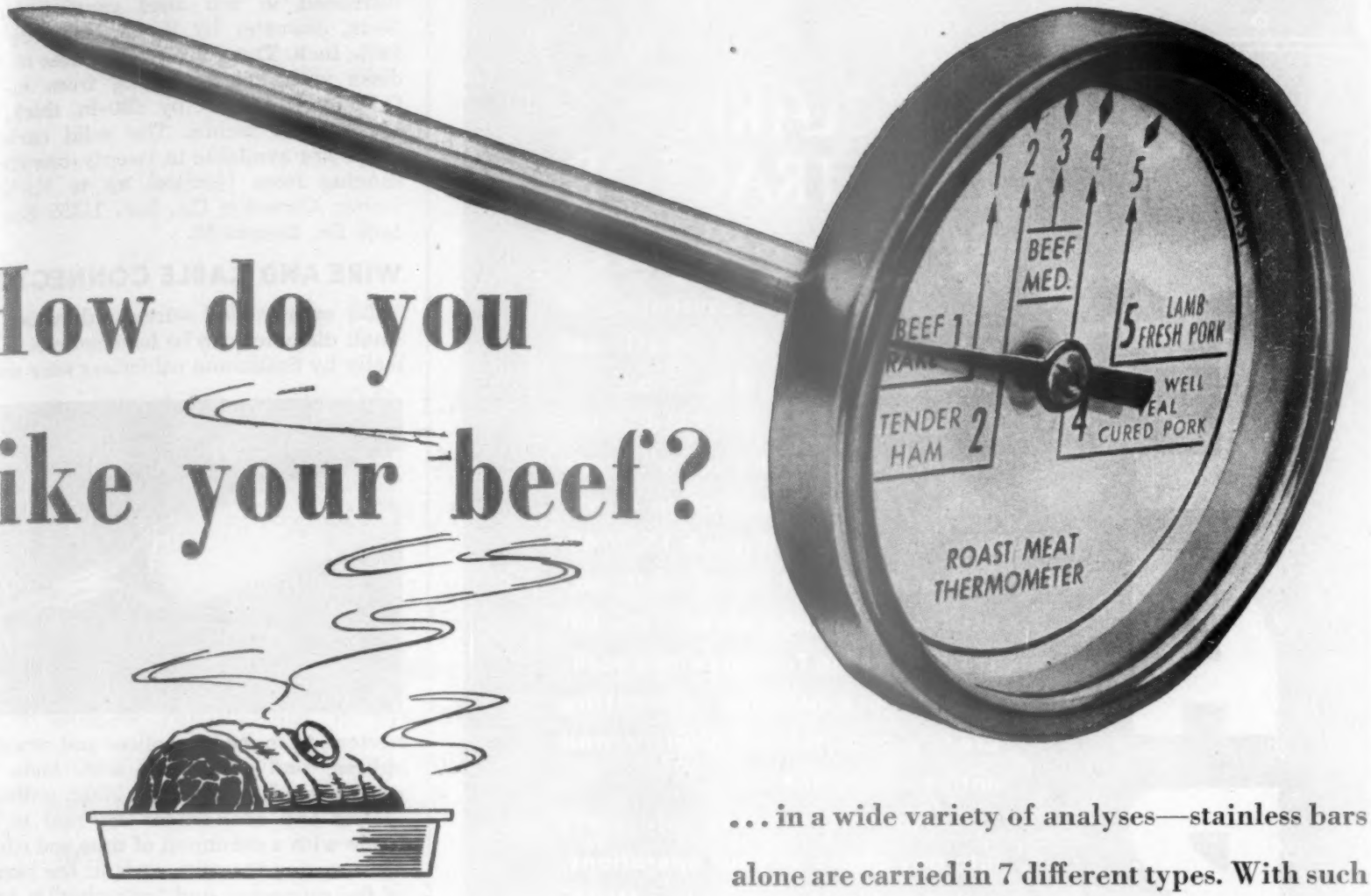
charger and 75-ampere welder; and the 77-PFC is a 10-ampere charger and 55-ampere power-factor-corrected welder. They charge up to four discharged batteries, and protect against reverse polarity connections and short circuits by means of automatic circuit breaker. There is a choice of three welding heats. The units are suitable for flame torch attachment for brazing and soldering. Larkin Lectro Products Corp., 160 West 146th St., New York 30.

CARBIDE DISKS AND STRIPS

Three cemented carbide products—solid disks, disks with holes, and solid strips—



How do you like your beef?



Rare, medium, or well done . . . this thermometer lets you roast meat exactly to your taste. Sanitary and corrosion-proof, it's made of stainless steels—not just one steel, but *four*.

The dial case is stainless type 430 strip, the collar, type 416 bar, the stem is type 304 tubing, and the pointed plug is turned from type 302 bar. Although each stainless type is used for a specific advantage, *all* 4 types are supplied by Frasse.

For Frasse stocks stainless in every rolled form . . . in a wide variety of analyses—stainless bars alone are carried in 7 different types. With such a wide choice to work with, you get more than just "stainless" — you get the stainless *best* suited to your job.

Our recent inventory shows the complete range of stainless steels immediately available from Frasse. Send for your copy today. *Peter A. Frasse and Co., Inc., 17 Grand Street, New York 13, N. Y. (WAlker 5-2200) • 3911 Wissahickon Avenue, Philadelphia 29, Pa. (BAldwin 9-9900) • 50 Exchange Street, Buffalo 3, N. Y. (Washington 2000) • Jersey City • Syracuse • Hartford • Rochester • Baltimore*

FRASSE *for stainless steels*

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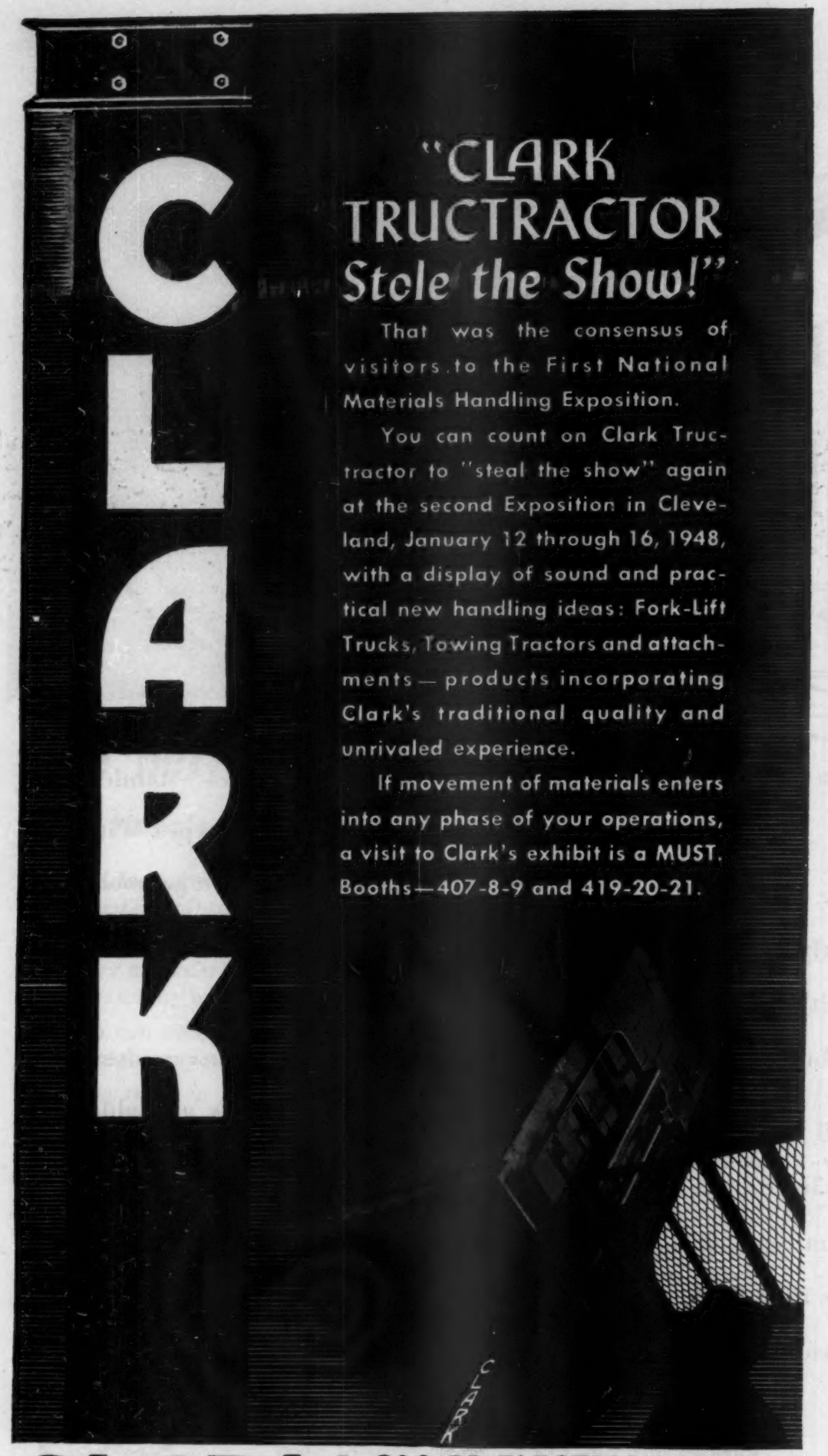
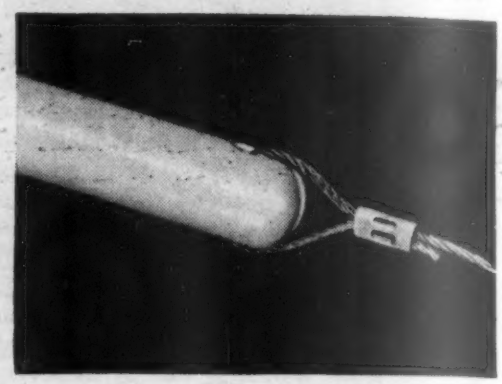
TUBING • PIPE • FITTINGS • WIRE • ELECTRODES


CLARK
"CLARK TRUCTRACTOR Stole the Show!"
That was the consensus of visitors to the First National Materials Handling Exposition.
You can count on Clark Tructractor to "steal the show" again at the second Exposition in Cleveland, January 12 through 16, 1948, with a display of sound and practical new handling ideas: Fork-Lift Trucks, Towing Tractors and attachments — products incorporating Clark's traditional quality and unrivaled experience.
If movement of materials enters into any phase of your operations, a visit to Clark's exhibit is a MUST. Booths—407-8-9 and 419-20-21.
CLARK GAS OR ELECTRIC POWERED FORK TRUCKS
AND INDUSTRIAL TOWING TRACTORS
CLARK EQUIPMENT COMPANY, TRUCTRACTOR DIVISION, BATTLE CREEK, MICHIGAN
REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

are announced for wearproofing tools and equipment. The solid disks are furnished in ten sizes ranging from ⅛-in. diameter by 1/16-in. thick, up to 1x3/16 inch. There are twelve sizes of the disks with holes, ranging from ¼-in. O.D. by ⅛-in. I.D. by .030-in. thick, to 1¼x5/16x.060 inches. The solid carbide strips are available in twenty-one sizes, ranging from 1/16x⅛x3 up to ¼x¾x6 inches. Carboloy Co., Inc., 11155 East 8 Mile Dr., Detroit 32.

WIRE AND CABLE CONNECTOR

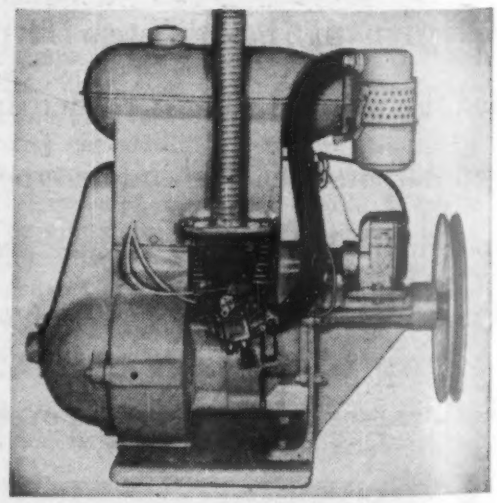
Solid or stranded wires and cables of small diameter can be fastened mechanically by Solistrand solderless wire con-



nectors, to make eye splices and straight splices, and to attach wire ends to screws, studs, and hooks. Neat, uniform splices and connections are said to be made with a minimum of time and effort by inserting the wire ends in the barrel of the connector, and "crimping" it with a single operation of the installation tool. No clamps or wire twisting is necessary. Aircraft-Marine Products, Inc., 1563 North 4th St., Harrisburg, Pa.

GASOLINE ENGINE

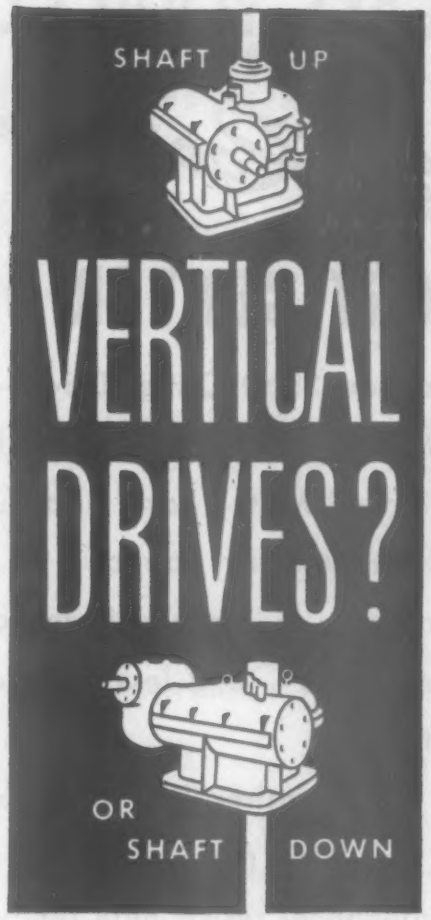
Known as the Frazer, a lightweight, stationary engine is a 5-hp., 2-cycle, single-cylinder gasoline type, with impulse-coupled magneto. It runs from 6 to 8 hours on 2 gallons of gasoline, depending on the amount of work performed. Provides power for operating saws,



hammer mills, concrete mixers, air compressors, and other machines. Mounted on a metal base plate and fitted with a V-belt pulley power take-off, the engine occupies less than 3 square feet. Graham-Paige Motors Corp., York, Pa.

PNEUMATIC HAMMER

Air-lubricated, air-cooled pneumatic hammer has a loose-fitting piston, and



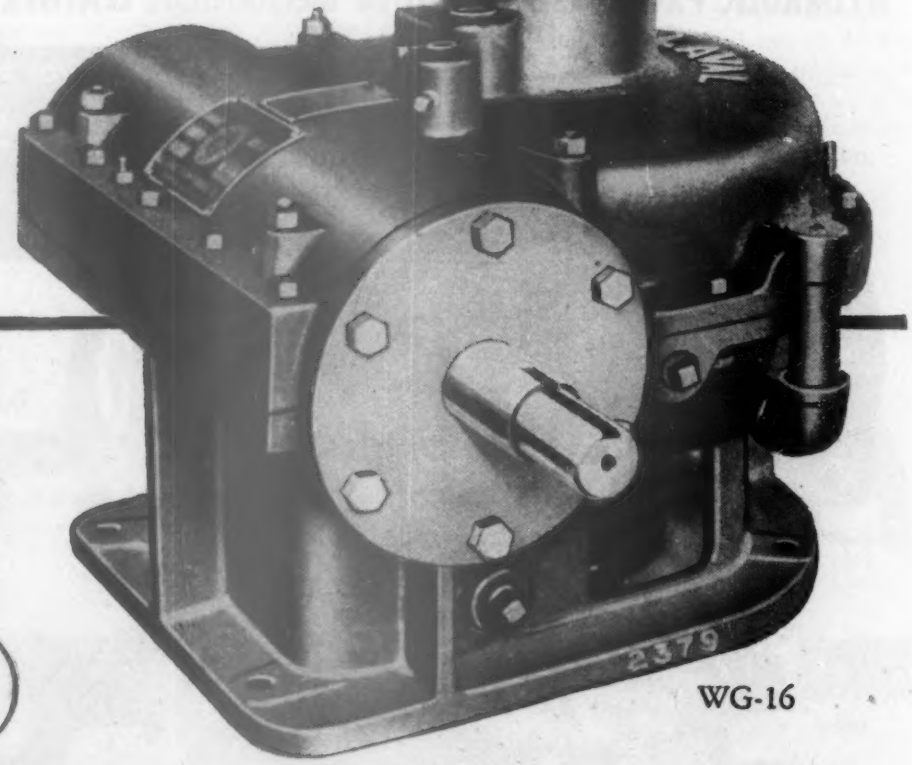
DE LAVAL VERTICAL DRIVE REDUCERS

A complete line of De Laval vertical speed reducers, in both single and double reductions, is available for driving agitators, mixers, and many other types of vertical shaft equipment.

If vertical drives are your problem, consult De Laval.

✳ This single reduction De Laval Worm Gear Reducer is available with many standard gear ratios and is but one of the 93 sizes of standard De Laval Worm Gear Speed Reducers.

✳ ONE OF 93



WG-16

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DE LAVAL

***Worm Gear Division*, De Laval Steam Turbine Company, Trenton 2, New Jersey**

TURBINES • HELICAL GEARS • WORM GEAR SPEED REDUCERS • CENTRIFUGAL PUMPS • CENTRIFUGAL BLOWERS AND COMPRESSORS • IMO OIL PUMPS

STEP UP YOUR PRODUCTION . . .
DECREASE YOUR COSTS

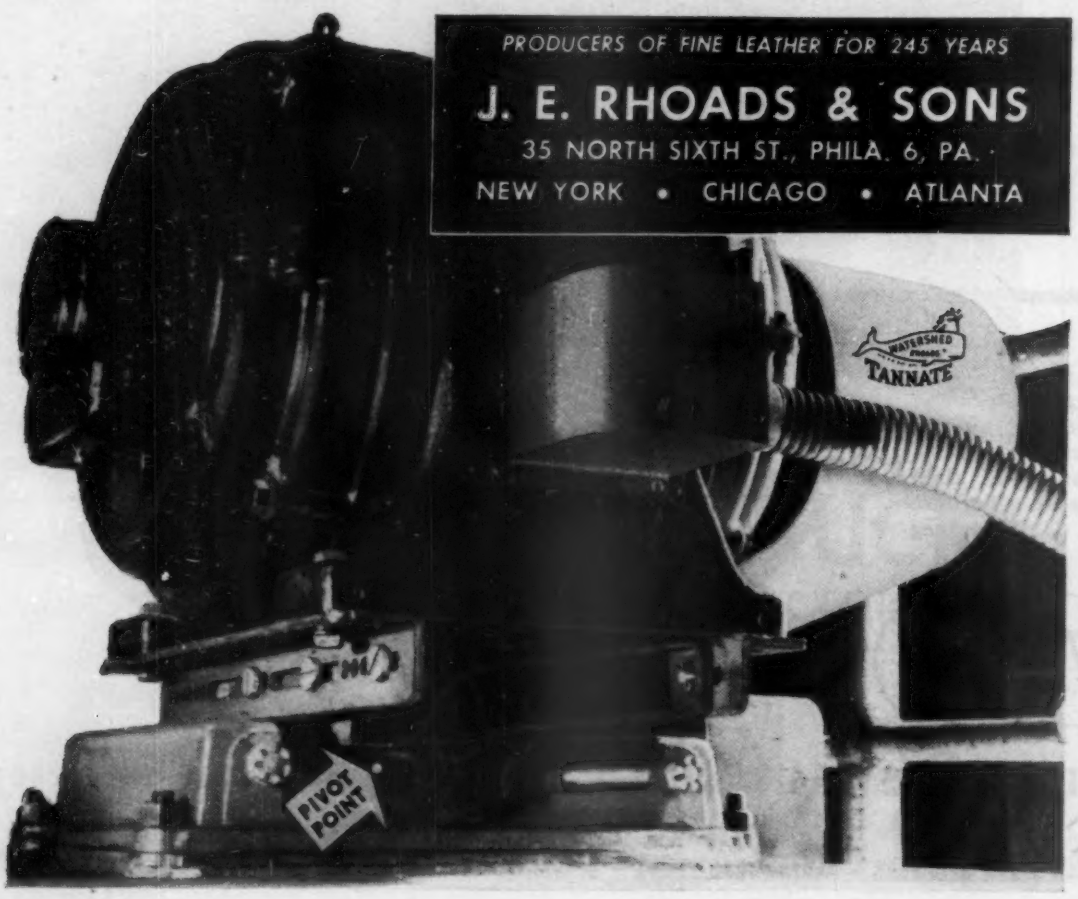
with RHOADS *Tannate-Rockwood*
SHORT CENTER DRIVE

Tannate-Rockwood Short Center Drives—a reliable combination of Tannate Flat Leather Belt, Rockwood Pivoted Motor Base and Pulleys—assure constant, uniform speeds . . . higher hourly production . . . more uniform work . . . fewer shutdowns . . . and less wear on bearings and belt.

Tannate Flat Leather Belt provides long, trouble-free belt life; requires fewer take-ups and less maintenance; resists high temperatures, water, machine oils and many chemicals. Pivoted motor base automatically maintains correct belt tension regardless of load fluctuations.

Write for detailed information about this cost-reducing, production-increasing combination.

HYDRAULIC PACKINGS AND OTHER MECHANICAL LEATHER PRODUCTS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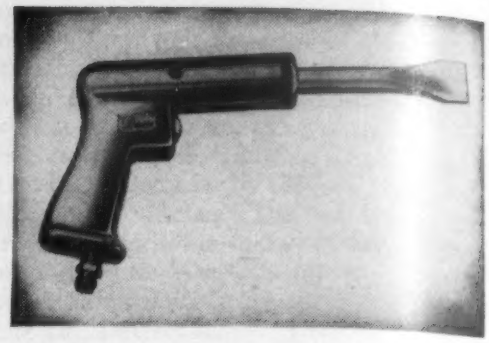


requires only a few drops of oil a month to prevent internal corrosion. A built-in tool holder prevents the tool set from shooting out if the air power is turned on accidentally. Tool sets are interchangeable from one type hammer to another. Made in two models—a light general-purpose unit for riveting, scaling, scraping, or cutting; and a medium-weight hammer for breaking plaster, chipping, peining, and other work. A head, standard on all models, permits the use of either fixed or loose tool sets. Dow Pneumatic Tool Co., 39 South La Salle St., Chicago 3.

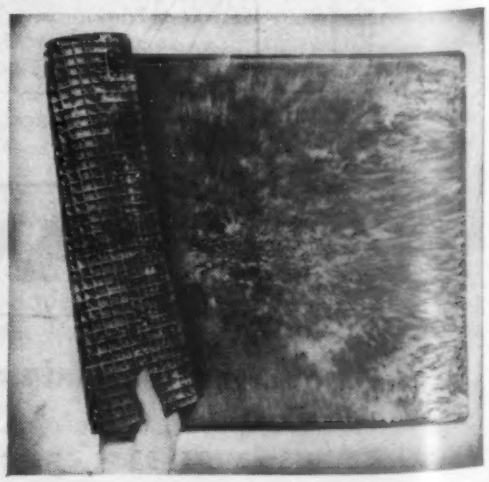
POWERED HAND TRUCK

Built like a two-wheeled hand truck, Mototruk is a power-driven unit. Trucking loads up to 1500 pounds, maker says

it moves materials up steep inclines and over obstacles without undue strain to the operator. Comet Manufacturing Co., 9253 Nicollet Ave., Minneapolis.

RUBBER MAT

Non-marking, non-skid rubber mat, called Stand-eze Softaire, is made up of almost 2000 small rubber cells, which are said to act individually and collectively to protect legs and feet from



If you can make it of steel you can make it better with Stainless

(ESPECIALLY IF IT'S U·S·S STAINLESS STEEL)

DOES YOUR PRODUCT NEED GOOD LOOKS TO MAKE IT SELL? — MAKE IT WITH U·S·S STAINLESS

There's "buy-appeal" in the permanent beauty of U·S·S Stainless Steel. Its attractive appearance will dress up the most ordinary industrial equipment—in products bought by the public its eye-catching lustre often means the difference between profitable sales and costly inventories. U·S·S Stainless can be produced in any finish from a dull gray matte to brilliant mirror-polish. And because buyers know that its beauty goes through and through, can never wear or chip off, the demand for Stainless is greater than ever and is steadily growing.

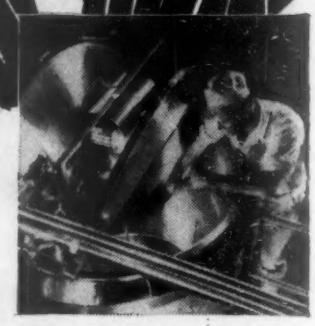
DOES IT NEED HIGH RESISTANCE TO CORROSION? — MAKE IT WITH U·S·S STAINLESS

No other commercial metal can match Stainless Steel in its high resistance to so many types of corrosives. Stainless Steel owes that resistance to a thin film that protects the surface from attack. At normal temperatures this film is transparent and invisible; at elevated temperatures it darkens and becomes a tight covering that helps to prevent further oxidation. U·S·S Stainless Steel's high corrosion resistance makes it especially valuable for chemical and food plant equipment, in textile machinery, in automobile and aircraft parts—and for kitchen utensils and other everyday products.

MUST IT WITHSTAND HIGH TEMPERATURES? — MAKE IT WITH U·S·S STAINLESS

Any material which is subjected to extremely high temperatures must be able to resist oxidation at those temperatures. It must at the same time retain much of its original strength. U·S·S Stainless Steel does both. Its high creep strength at elevated temperatures assures mechanical stability under severe operating conditions. Even in such exacting service as in refinery pressure vessels, in aircraft exhaust systems, cabin heaters and in jet engine combustion chambers where temperatures run as high as 1600 degrees F., U·S·S Stainless Steels give dependable service.

IS EASY CLEANING IMPORTANT? — MAKE IT WITH U·S·S STAINLESS



U·S·S Stainless Steel is so easy to clean that much of the cost, time and labor required in cleaning ordinary materials can be eliminated by its use. Stainless Steel's ability to resist adherence also results in appreciable cost savings. It is a fact that many materials—many food products, rayon gums, wood gums and resins, etc. — that adhere readily to common steel, will not adhere to Stainless. That is why Stainless Steel equipment can frequently be run for longer periods *without* cleaning.

DO YOU WANT TO REDUCE ITS WEIGHT? — MAKE IT WITH U·S·S STAINLESS

Because Stainless Steel—cold rolled to induce high tensile strength —is 2½ times stronger than plain steel, and because its superior corrosion resistance eliminates or reduces the need for corrosion allowances, it can be used safely in very thin sections to affect tremendous savings in weight. Properly designed products and equipment, built lighter of U·S·S Stainless, will withstand punishing service and long use, and will frequently cost little more than ordinary construction.

AND HERE'S WHY IT PAYS TO USE U·S·S STAINLESS STEEL

U·S·S Stainless is a perfected, time-tested stainless steel, so uniform in composition, in finish and in fabricating qualities that it allows the widest latitude in design and permits the use of the most advanced manufacturing techniques. It is available in the most complete range of forms, sizes and surface finishes anywhere obtainable.

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

USS STAINLESS STEEL UNITED STATES STEEL

7-1242

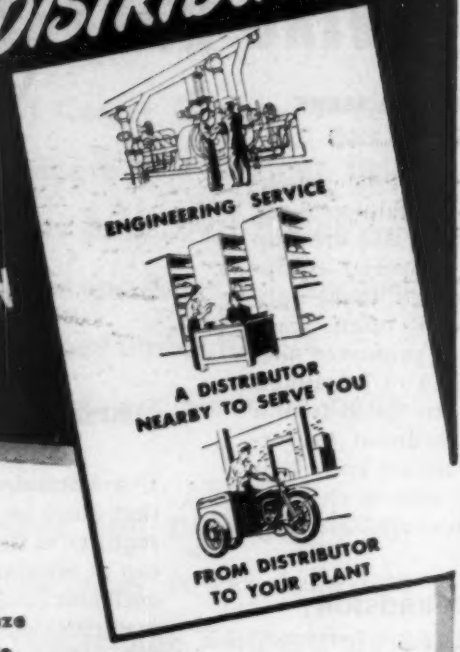
UNITED STATES STEEL AMERICAN STEEL & WIRE COMPANY, Cleveland, Chicago & New York
CARNEGIE-ILLINOIS STEEL CORPORATION, Pittsburgh & Chicago • COLUMBIA STEEL COMPANY, San Francisco
NATIONAL TUBE COMPANY, Pittsburgh • TENNESSEE COAL, IRON & RAILROAD COMPANY, Birmingham
UNITED STATES STEEL SUPPLY COMPANY (Warehouse Distributors), Chicago • UNITED STATES STEEL EXPORT COMPANY, New York

Relied upon

BY VALVE MAINTENANCE MEN EVERYWHERE . . .

LUNKENHEIMER DISTRIBUTORS

RENDER A SERVICE THAT IS ESSENTIAL—A VITAL LINK IN THE CHAIN OF INDUSTRIAL PRODUCTION



Located in principal industrial centers, Lunkenheimer Distributors provide direct, readily accessible, time and money-saving service throughout the nation.

In addition to supplying high quality, long life Lunkenheimer Valves, they render valuable aid to maintenance men in the solution of both operating and maintenance problems.

This service isn't new . . . Lunkenheimer Distributors have been providing it for many years in the past, and will continue doing so in the future.

For this Distributor set-up is a basic, permanent part of the Lunkenheimer way—the *better service* way.

Remember—you can *always* depend on your nearby Lunkenheimer Distributor for expert, willing assistance in any problem or difficulty involving valve maintenance or operation. Call on him!

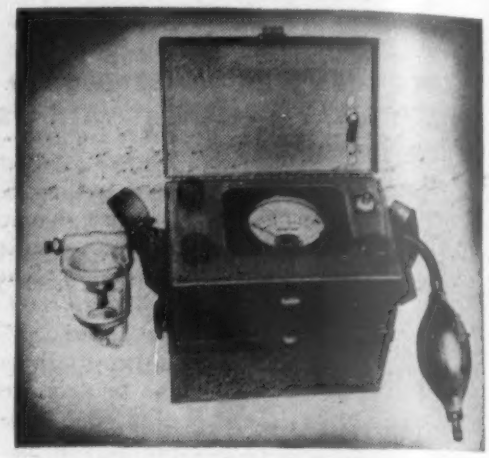
The Lunkenheimer Co., Cincinnati 14, Ohio. New York 13, Chicago 6, Boston 10, Philadelphia 34, Export Department: 318-322 Hudson St., New York 13, N. Y.

LUNKENHEIMER VALVES

strain. The cells gather and retain air, and thin rubber strips criss-cross each small cell, producing a "squeegee" action. This results in resiliency without annoying softness, maker claims. Available in 16x23½-in. size, the mat is also made in neoprene oil- and grease-resistant rubber. Colonial Rubber Co., Ravenna, Ohio.

COMBUSTIBLE GAS TESTER

Designed to determine hazardous conditions caused by combustible or explo-



sive concentrations of flammable gases or vapors, Model 6 Vapotester is a 2-range instrument. One range analyzes combustible gases in terms of their lower explosive limit. A second scale indicates gases in their toxic range. Switch includes one position for the combustible range (1-1 range), one position for checking the voltage, and a third position to increase the sensitivity of the first scale ten times. On one scale, without any special adjustments, the parts per million of the gas being tested may be read. A calibration-curve chart furnished with the instrument shows how it will read on certain gases. Davis Emergency Equipment Co., Inc., 45 Halleck St., Newark 4, N. J.

CHANGE IN OWNERSHIP

Goodrich **Electric** Company, manufacturer of floodlights and industrial lighting equipment, has been purchased by the Appleton Electric Company, Chicago, producer of electrical conduit fittings and other electrical specialties.

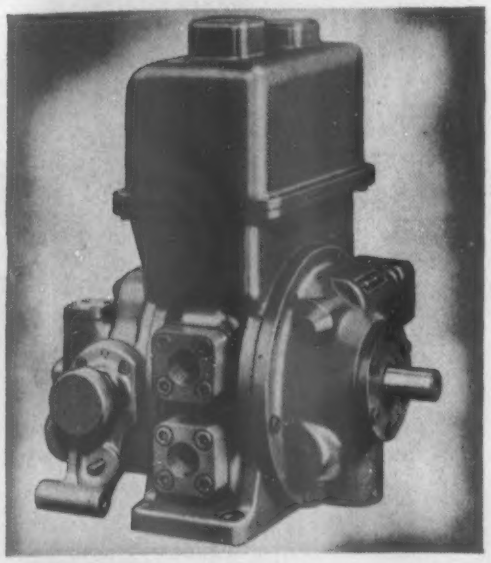
AIR NOZZLE

Featuring four interchangeable noses, heavy-duty Model 143-A air nozzle is made of a heat-treated duraluminum forging claimed to combine high strength with light weight. The four noses available are: a general-purpose nose; a

long nose which can be bent to requirements; an adjustable nose for high-pressure lines or where air blast must be controlled; and a wide, flat nose for broad surfaces. Convenient operating button at top is guarded against damage. Nozzle has pistol grip to fit the hand, and a loop for hanging. Neoprene washer withstands oils and acids in air. Self-cleaning seat prevents leakage. The Imperial Brass Mfg. Co., 1200 West Harrison St., Chicago 7.

FEED PUMP

Fluid power variable delivery feed pump is electro-hydraulically controlled. Ap-



plied nearby or remotely, it is automatic-pressure-compensated. Fine and coarse feeds are adjustable over a 20:1 range. It provides from 13:1 to 265:1 variable ratios between feeding and rapid traverse speeds. Requires two pipelines. Solenoids for 110-, 220-, 440-, or 550-volt; 25-, 50-, or 60-cycle a.c. operation are standard. The Oilgear Co., 1418 West Bruce St., Milwaukee 4.

GAS-FIRED HEATER

Model CS-95 gas-fired unit heater has cast-iron ribbon-type burners said to operate quietly, without flashbacks, and which are removable for cleaning. Cast-iron heat exchangers have internal as well as external fins. The heater includes kidney-shaped 16-in.-diameter aluminum fans, built-in draft hood, automatic controls, and accessibility to all

SAVES on carload shipping of low-priced product

$7 to $8 less cost per car . . . perfect arrival condition . . . when asphalt products are shipped from New Jersey to Detroit with Acme Unit-Load method

55-gallon drums of asphalt products are loaded like this. Simplified methods of stowing and bracing and use of Acme Unit-Load Bands and Stays eliminate dunnage, reduce cost by $7 to $8 per car.

The Flintkote Company ships thousands of cars of asphalt products from its New Jersey plant alone. Even a small saving in shipping cost would materially increase profits on large-volume, low-priced items.

Acme Shipping Specialists suggested the use of the Acme Unit-Load method to brace the load in the freight cars. This eliminated the use of costly lumber dunnage, reduced labor time, and saved the shipper $7 to $8 on every carload.

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You, too, may have a shipping situation which could be improved. Why not ask an Acme Shipping Specialist to consult with your firm? There is no obligation.

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parts. United States Air Conditioning Corp., Northwestern Terminal, Minneapolis 14.

TIME SWITCH

Self-contained Time Switch Sr. turns on or off any type of electrical apparatus on a predetermined time schedule, operating at 110 volts a.c. The clock is self-starting, with a sweep second hand. A switch dial, geared to the clock mechanism, revolves at the

rate of one revolution per day. Dial face has two adjustable switch fingers—one for off, the other for on, which operate a snap-action switch. Double-pole relay, rated at 1-hp. motor load, can break 20 amperes of non-inductive or heater load. The switch is housed in sheet-steel case. Front is removed for setting clock and switch. The operating cycle repeats continuously as long as the clock is not disconnected. Palo-Myers, Inc., 81-83 Reade St., New York 7.

BELTING COATING

Suitable for use on rubber, rubber belting, and cotton belting, plastic coating No. 40 combines the properties of synthetic rubber with the chemical resistance of Vinyl resins. Result is said to be a strong, non-toxic, non-contaminating, water-resistant film. Maker states it will stand continuous flexing, and adheres to rubber, canvas, metal, concrete, and wood. Applicable to conveyor and other belting subject to abrasion, spillage of water, grease, oil, and other chemical solutions and cleaning agents. Made in two grades—No. 40, providing the harder film, and No. 40X, effecting an extensible film similar to soft rubber. Amercoat Div., American Pipe & Construction Co., P.O. Box 3428, Terminal Annex, Los Angeles 54.

DIP CLEANING MACHINE

Work is agitated and dipped in redesigned Aja-Dip cleaning machine. It has a grouped control and instrument panel. Drive mechanism is located in dirty parts is mechanically raised and the front of the machine for access and servicing. The platform containing the lowered 60 times a minute through the cleaning solution, with an 8-in. vertical

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PROTECTION—Protects against abrasion, acids, alkalies, chemicals, corrosives, stains, salt-water, slime and irritants.

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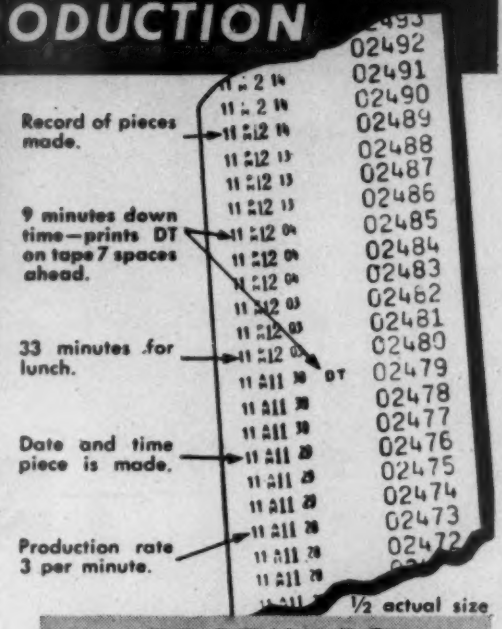

½ actual size

Operators can't count empty cycles — LECTRO-COUNT* only records cycles under load. At the right is illustrated the record you receive. Down time is recorded, also rate of production, minute and date. Remote installation in the production control department or any other location of your choosing. Can be set to provide for multiple operations.

LECTRO-COUNT* is the ideal counter for stamping presses, forge hammers, screw machines, drill presses and a host of other machines.

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Mention the type of machine, and the operation performed to help us determine if LECTRO-COUNT* is applicable.

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FEATURES

- ★ Remote installation.
- ★ Controls and Recorder pre-set and locked.
- ★ Permanent tape record of daily operation.
- ★ No empty cycles or false counts.
- ★ Voltmeter will indicate dull tools, tight bearings, improper steel.

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LANSING ENGINEERING COMPANY
731 E. KALAMAZOO ST. LANSING 12, MICHIGAN

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C/R Hammers have malleable iron heads with replaceable coiled rawhide faces.

RAWHIDE is tops for "soft" mallets and hammers. And you can't beat *Chicago* Rawhide. Tightly coiled, specially treated C/R surfaces won't split, crumble or mushroom. They absorb shock, deliver powerful blows, protect delicate surfaces, and stand up under tough use. Always ask for *Chicago* Rawhide.

Other C/R maintenance products are: round, flat, twist belting; belt pins and lacings; gears, pinions, gear blanks; aprons, hand leathers; hydraulic packings.

CHICAGO Rawhide MFG. CO.
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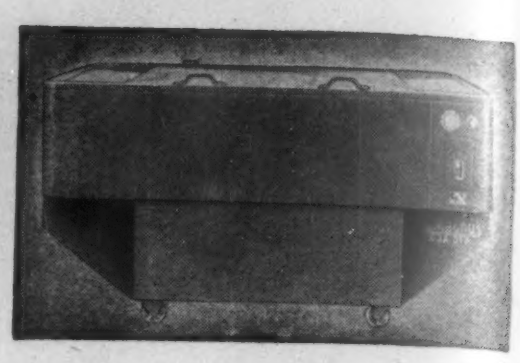
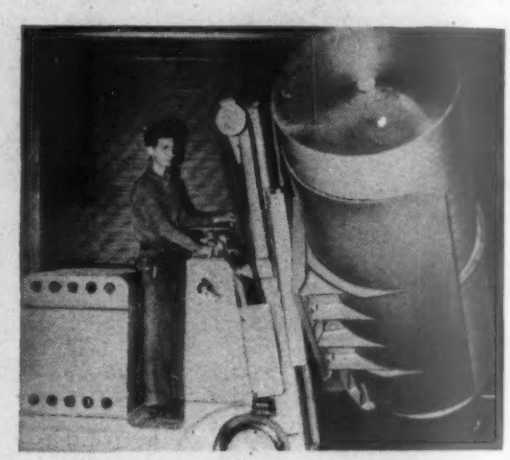


labor only for loading and unloading. Available in 13 sizes and types, from the Midget, handling a few pounds of work, to the Jumbo, handling 2200 pounds at a time. May be used with hot or cold cleaning solutions, and can be heated by steam, electricity, or fuel. Equipment Div., Dept. FM, Magnus Chemical Co., Inc., Garwood, N. J.

FORK TRUCK ATTACHMENT

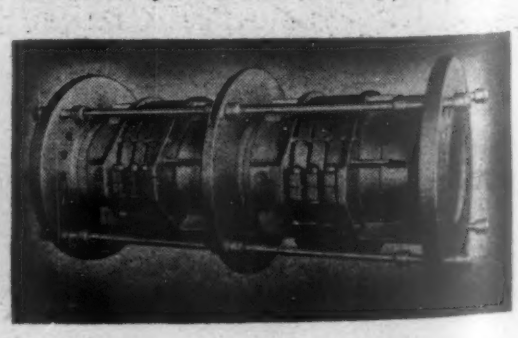
Hydraulically operated rotating carriage attachment for manufacturer's fork trucks can be installed on electric, gasoline, or gas-electric models. Keeps the

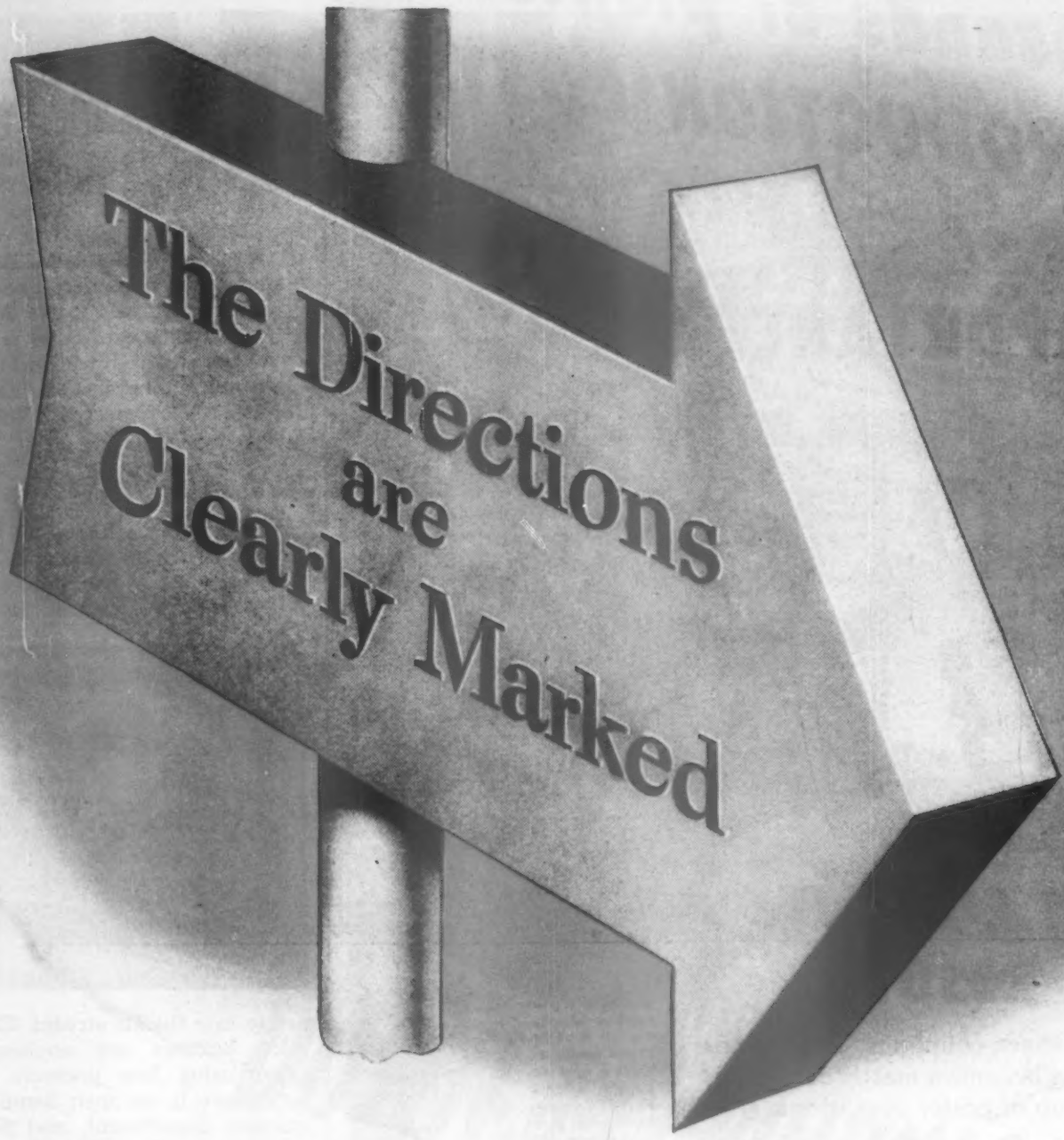


load close to the front wheels for maximum utilization of the inch-pound rating of the truck. When used in conjunction with the paper roll attachment, only 90 degrees of the full rotation is required. Adjustable stops are used to limit travel. The paper roll attachment consists of a full curved backplate, which fits the contour of the rolls; and a polished and ground toe plate with a beveled leading edge for entering under the headings of paper rolls. No pallets or dunnage are needed, and rolls may be picked up in either a vertical or horizontal position and deposited in reverse. Lewis-Shepard Products, Inc., 291 Walnut St., Watertown 72, Mass.

UNIVERSAL EXPANSION JOINT

Universal expansion joint is built to absorb movement of high-temperature lines in any direction—axially, laterally,





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The increasing demand for JESSOP Cast-to-Shape Tool Steels is positive proof of their outstanding advantages to industry. Because they are furnished in the shape in which they will be used, JESSOP Cast-to-Shape Tool Steels require only a minimum of finish machining, thus accomplishing important savings in labor, material, and processing costs.

JESSOP Cast-to-Shape Tool Steels can be supplied in analyses to meet the requirements of a high percentage of tool steel applications. Write and tell us what you need . . . we can make it for you.

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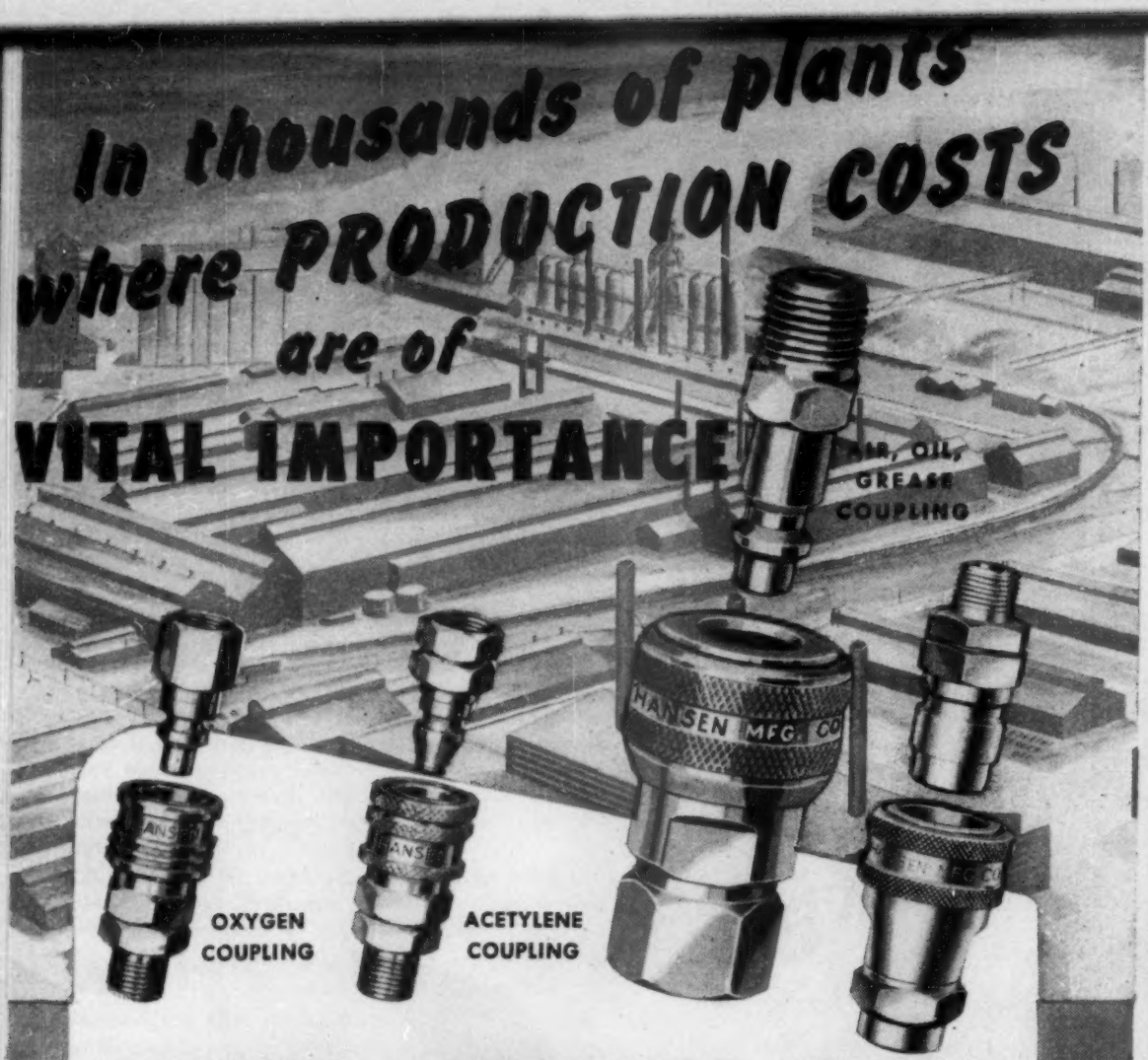


HANSEN COUPLINGS GET RESULTS

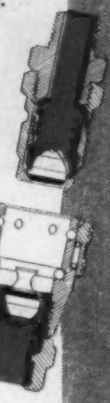
When you use Hansen couplings, connections and change-overs become a matter of seconds —with no hold-up of costly operations.

To connect a Hansen coupling on air, oil or grease lines, you merely push plug into socket —flow is immediate and completely automatic. To disconnect, slide sleeve back with thumb, plug pops out, and supply line is effectively sealed with no leaks or losses.

It's the minutes saved on operations repeated over and over that add up to substantial savings. There's a Hansen coupling for every purpose or pressure requirement — for air, oil, or grease — for oxygen — for acetylene — also the new Hansen two-way shut-off coupling which completely seals both ends of line when disconnected.

Write for industrial catalog!

The Hansen Two-Way, Shut-Off Coupling.



Red section shows how rubber washer in valve stem contacts valve seat in both plug and socket, sealing both plug and socket against leakage instantly.

Red section shows flow of liquid or gas around spool section of valve, permitting free flow of liquid or gas through coupling instantly upon connection.

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New England States: A. D. GEIGER, Belmont, Mass.
Eastern, Southern States: B-R ENGRG. CO., Baltimore, Md.
Northern Ohio: F. & W. URSEM CO., Cleveland, O.
Southern Ohio, West Va., Ky.: STEINHAGEN AIRLINE PRODUCTS, Dayton, O.
Northern Ill., Eastern Iowa: NORRIS ENGRG. CO., Chicago, Ill.
Indiana, Wisconsin: NEFF ENGRG. CO., Ft. Wayne, Ind.
Central Western States: JOHN HENRY FOSTER CO., St. Louis, Mo., Minneapolis, Minn.
Western, Southwestern States: BURKLYN CO., Los Angeles, Calif.
Northern Calif., Nevada: H. E. LINNEY CO., Oakland, Calif.
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THE HANSEN MANUFACTURING CO.

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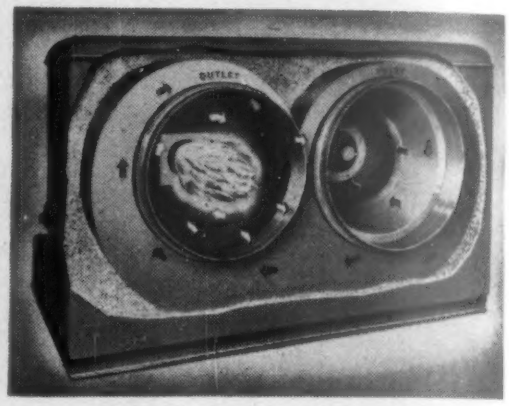
or angularly, or any combination of the three. It is said to have no sharp crevices in which contents can pack. Consists of two corrugated elements linked together by a section of pipe. The amount of lateral movement that can be absorbed depends on the length of pipe between the corrugated elements. The expansion elements can be either of non-equalizing type for pressures up to 30 pounds, or self-equalizing for higher pressures. Designed to suit requirements for all temperatures and pressures. Zallea Bros. & Johnson, 888 Locust St., Wilmington 99, Delaware.

OVEN HEATER

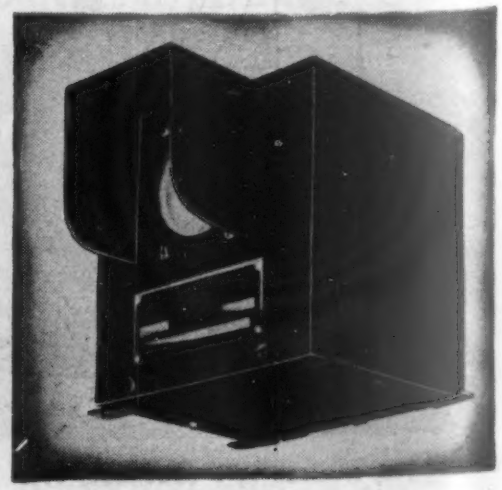
Scroll-Aire, a direct gas-fired heater, for paint drying, core and mold, moisture drying, and processing ovens, mixes the products of combustion di-



rectly into the air stream. The main and pilot burners are enclosed pressure type, using low pressure combustion air. There is no open flame in the production department, and positive control is provided. The fan and heater unit is enclosed in a steel casing with tightly packed insulation. A packaged heating system, it eliminates handling component parts. Supplied with gas manifold, combustion air manifold, temperature controls, and safety controls installed. The heaters are available in units with 5000-, 10,000-, 15,000-, and 20,000-c.f.m. air capacities, each with a choice of from 250,000 to 4,000,000 B.t.u. burner capacities. Newcomb-Detroit Co., 5741 Russell St., Detroit 11.

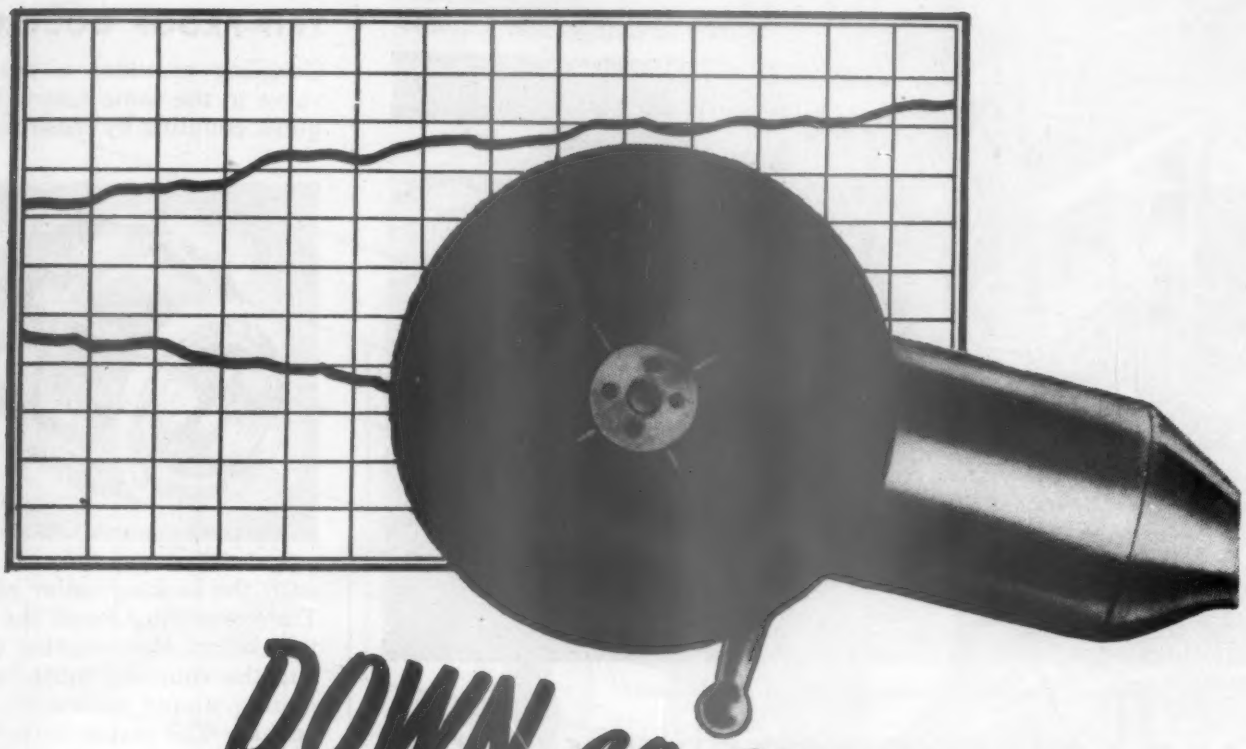
PHOTOELECTRIC CONTROL

Photoelectric switch, counter, gage, and control are combined in the Electronic Handyman. Requires no sensitivity adjustment. Of universal design, it plugs in any convenient outlet. It accepts the



WELDISK

UP GO GRINDING SPEEDS



DOWN GO GRINDING COSTS

Prove it to yourself with FREE SAMPLES

IF THE TEST of the pudding is in the eating, the test of an abrasive is in the grinding. It will pay you to test WELDISKS yourself—to prove to your own satisfaction that WELDISKS are superior abrasives for use on high-speed pneumatic grinders as well as on any portable electric grinder. You will be amazed to find that WELDISKS outlast ordinary disks by as much as 2-to-1 . . . partly because of their cold-setting cement (a scientific formula—not glue or resin) that actually improves with age, and partly because of their laminated backing of fibre for stiffness plus cloth for strength. A test of WELDISKS will convince you of their superiority. Write for free samples. State size of disk, grade of grit, and brief description of work to be done. WELDISKS will be sent promptly without obligation. Abrasive Products, Inc., 519 Pearl Street, South Braintree, Massachusetts.

ABRASIVE PRODUCTS, INC. JEWEL REG. U.S. PAT. OFF. ABRASIVES MADE IN U.S.A. SOUTH BRAINTREE, MASS. U.S.A.

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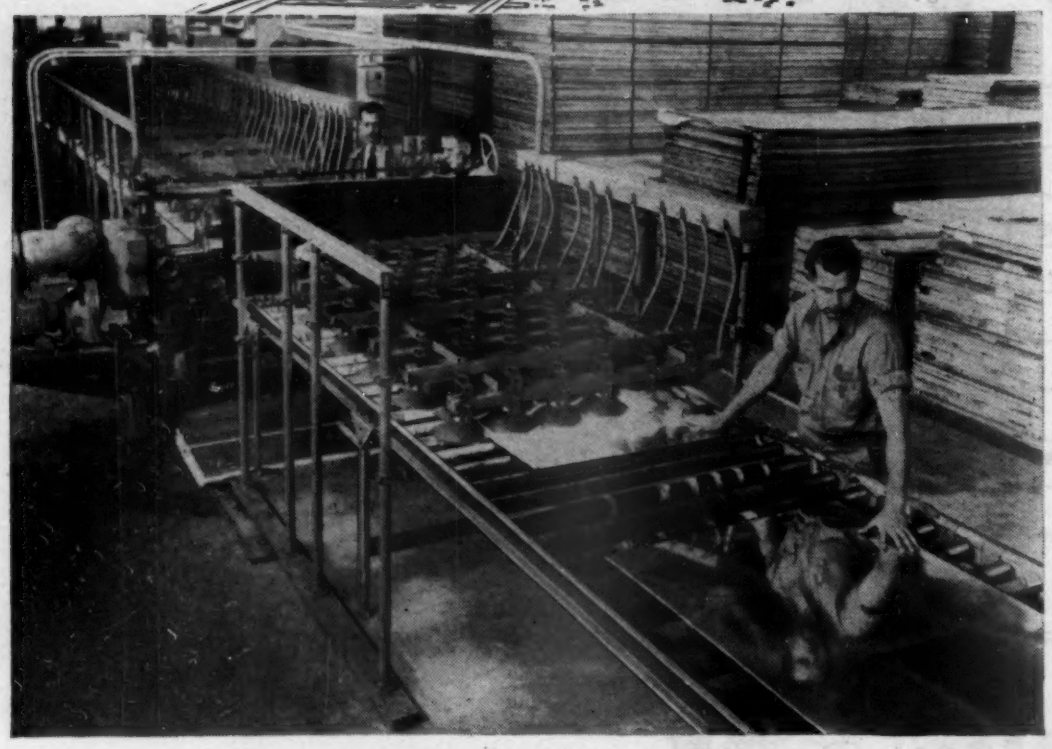

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The range and versatility of Standard Conveyor equipment is the result of nearly 40 years of close contact with inside-the-plant transportation — in plants large and small, making products as widely diverse as steel or cosmetics. The benefit of this experience is available to you, without obligation.

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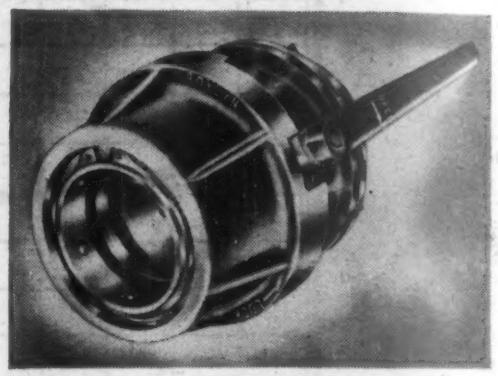
CLEVELAND JANUARY 12-16, 1948

plug of the product to be controlled at either of its normally on or normally off receptacles. In addition to high-speed counting and limiting travel, the control will measure light intensity as well as act as a switch. There is provision in housing for making it a combination counter or meter, and for filters for color or infra-red operation. The control is said to continue to operate over a wide range of line voltage shifts. Internal taps may be adjusted for different voltages. Has a self-guarding, safe-failing circuit. John T. O'Connor & Co., 209 South Valley Rd., West Orange, N. J.

TRIP-PROOF COUPLING

Coupling provides a positive shut-off valve in the same assembly as that of a quick coupling by meshing a valve lever



with the locking cellar of the coupling. The valve must be in the shut-off position before the coupling can be broken, and the coupling must be locked in its mating nipple before the valve can be opened. The piston-type valve effects a seal even with static pressure. Made of non-sparking bronze alloy, the trip-proof coupling weighs 11¾ pounds. Available in 2½-in. pipe thread sizes. Pressure tight caps, for closing off the open line, complete the installation. The coupling requires a 40-deg. rotation to activate it. Said to be easily operated, positive, vibration-proof, and requires no tools. Roylyn, Inc., 718 West Wilson Ave., Glendale 3, Calif.

WELDING TORCH HOLDER

Traveling holder for plate cutting with welding torch is designed to eliminate need for grinding and milling of the torch-cut edges, except for precision finishes. The portable unit holds the torch and feeds it along a straight line. By turning a geared crank at the end, the torch travels along a pre-determined line to cut through the metal. Known as the C & H Straight Line Cutter, it will hold any torch. Has an adjustable holder so the torch can be angled to cut bevel or scarf. Positive feed permits speed adjustment. Stainless steel wheel keeps torch at uniform distance from the work. Cutter is 5 feet long and weighs 42 pounds. J. A. Campbell Co., 645 East Wardlow Rd., Long Beach 7, Calif.

COOLANT PUMP

Totally enclosed motor in Gusher coolant pump Model 11029 is equipped with upper end bell having a large built-in

He pulls production DOWN!

> Because adequate wiring is basic ... and affects everyone in our industry ... Anaconda continues to promote this idea in a wide list of national magazines.

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Production quotas are a fiction, the most modern machines are inefficient, the best of workmen are frustrated when overtaxed, over-extended obsolete wiring can pull down plant efficiency 25 percent* or more.

To get the production curve up, ask your plant power engineer, your consulting engineer, electrical contractor or utility power salesman to put this demon *out*. Action now may save shutdowns and costly alterations later.

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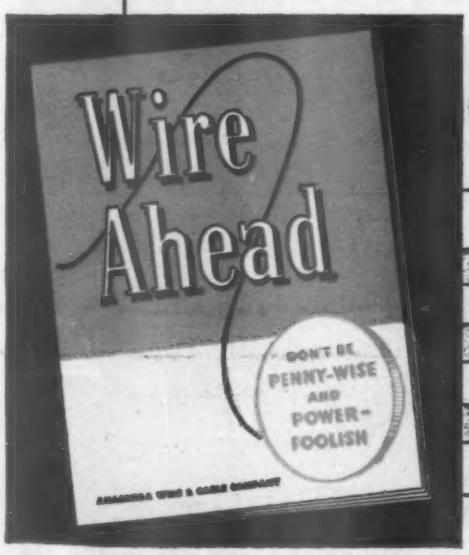

*WIRE AHEAD, a new booklet discussing preventive maintenance ... the symptoms of inadequate wiring ... and presenting plans for anticipating electrical demand, is now available on request. Address Advertising Department, 25 Broadway, New York 4, N.Y.

ANACONDA from mine to consumer

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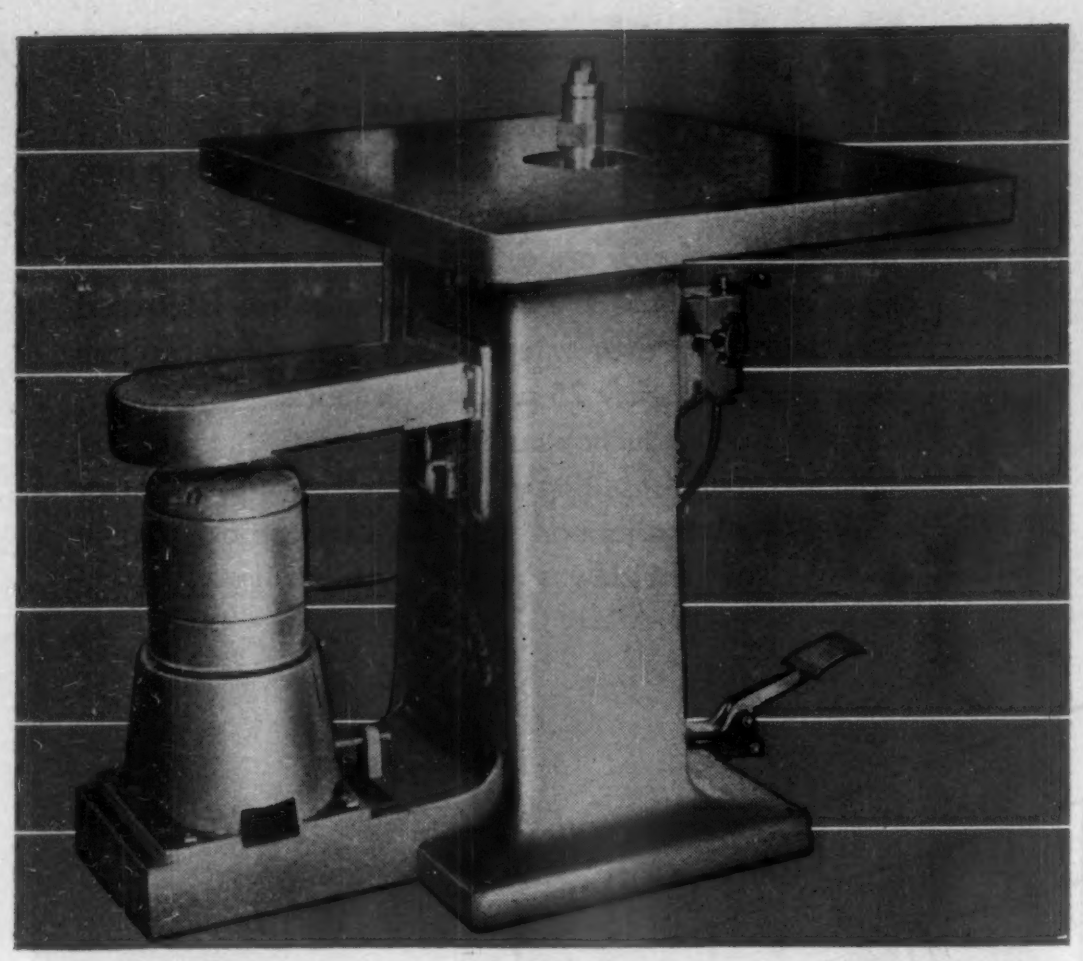

CRESCENT SHAPER

One-piece, cored-out frame... for accurate, vibrationless performance

A smooth finished job confirms your good judgment in equipping with a Crescent S-2 Shaper.

This self-contained, moderate-priced production unit is designed for general use on medium work. Here are some of the Crescent construction features that contribute to safe, easy, economical operation:

- Endless woven belt drives precision-ground spindle at a speed of 9000 RPM in one direction.
- Spindle is mounted in well-lubricated, high-grade ball bearings.
- Spindle and bearings enclosed in vertically-adjustable sash gibbed to the frame.
- Cast iron table is heavily ribbed and accurately machined.
- Sash may be locked securely in any position.

Standard equipment for the Crescent S-2 Shaper includes two sizes of combination fill-in and rubbing collars. Reversing switch and foot brake are available as additional equipment.

Your Crescent dealer can explain more fully why so many woodworking plants are enthusiastic users of Crescent Shapers. See him soon.

CRESCENT MACHINE DIVISION
Rockwell Manufacturing Company
Leetonia, Ohio

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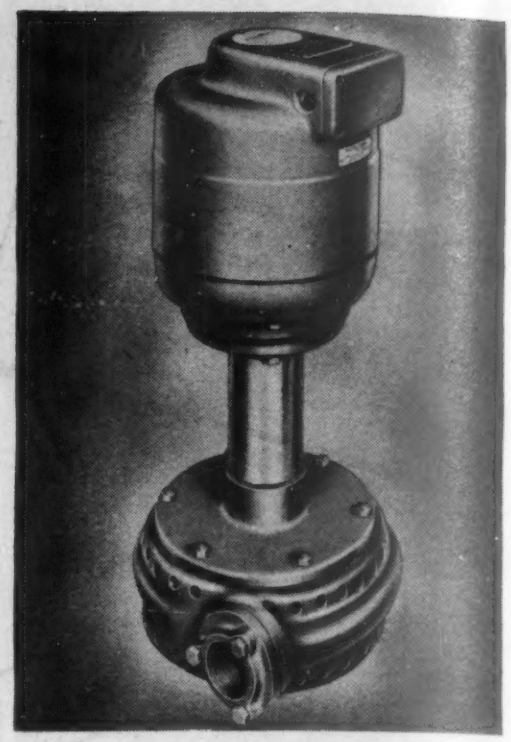
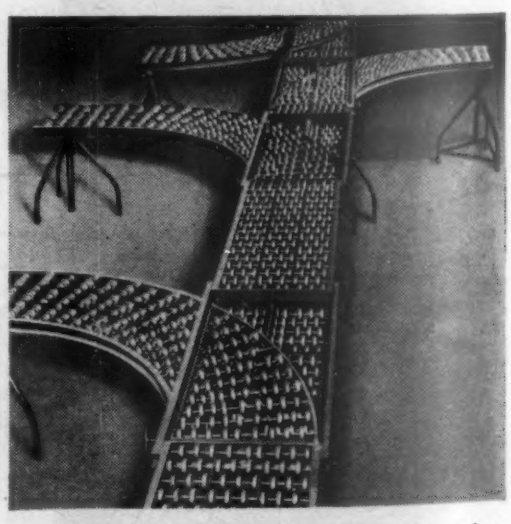


conduit box with capacity to accommodate the multiple lead wires of dual voltage stators. The through bolts fasten from inside the upper end bell. Twin inlets in the pump provide hydrodynamic balance, maker says, to eliminate end thrust on the shaft. All rotating parts are dynamically balanced by an electronic process providing quiet operation and long life. The pump handles liquids containing moderate amounts of grit and abrasives. There are no metal-to-metal contacts in the submerged portion. Capacity at 26-ft. head is 40 g.p.m. with ½-hp. motor, and 60 g.p.m. with ¾-hp. motor. The Ruthman Machinery Co., 1809 Reading Rd., Cincinnati 2.

CONVEYOR SWITCH

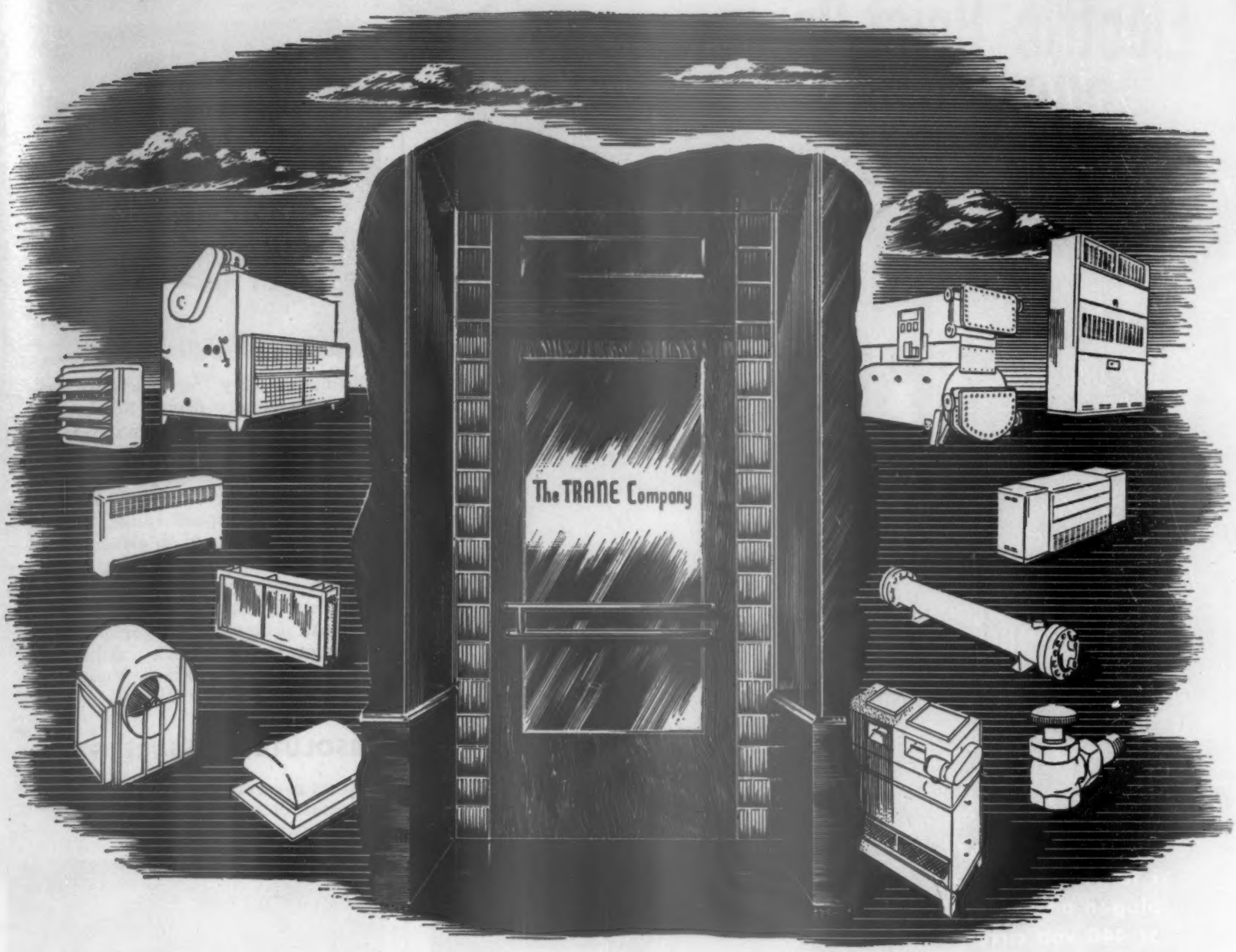
A "twist of the wrist" changes direction of material flow with conveyor switch which permits material to travel forward or to be diverted at 45-or 90-deg.



angles. Pulling of a lock-pin enables the center portion to swing on its own axis, allowing straight-ahead or curved side of switch to be used. Of all-welded steel construction, the switch is made in standard widths and in sizes for individual requirements. Sage Equipment Co., 30 Essex St., Buffalo 13.

HYDRAULIC TRANSMISSION

Variable speed hydraulic transmission Series TR2-R13F13 is rated at ½-hp.,



Trane Heating and Air Conditioning Is as Near as Your Telephone

Trane Engineered Air Conditioning—which refers to heating as well as cooling—stands for a complete line of engineered products. Each unit is developed and built by manufacturing engineers. Each is designed to work together with every other, for systems that function with the balance of matched components.

In addition, Trane product engineering extends to the drafting boards of architects, engineers, and contractors, where Trane Field Engineers cooperate in the application of Trane products and systems. Many of these field engineers are alumni of the Trane Student Class—an organization which each year trains outstanding engineering graduates in the problems of heating and air conditioning.

Because Trane manufactures a *complete* line of products, entire Trane heating and air conditioning systems are possible. There is a Trane Field Engineer within a few hours of any part of the country to work together with architect, engineer, and contractor in designing Trane systems.

* * *

The Convector-radiator—modern successor to the old-fashioned cast iron radiator—has been engineered by Trane for universal application to steam and hot water heating systems, and is being produced in quantity so you can now secure it from local distributors' stocks.

TRANE

Manufacturing Engineers of Equipment for HEATING AND AIR CONDITIONING

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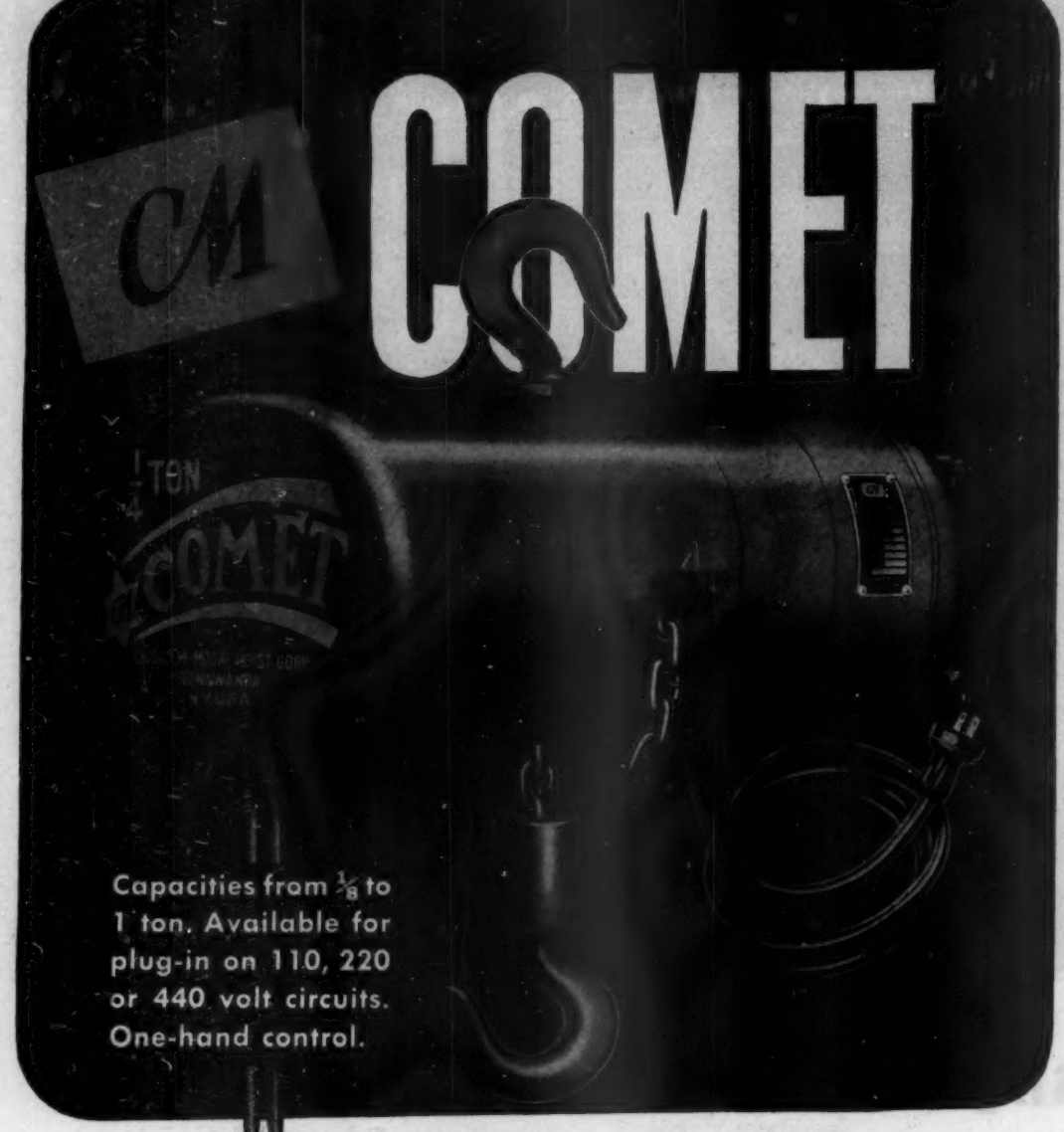
Electric Hoist-Power COSTS LESS

CM COMET



Capacities from ⅛ to 1 ton. Available for plug-in on 110, 220 or 440 volt circuits. One-hand control.

- ECONOMICAL
- PORTABLE
- SPEEDY
- STURDY

Manual handling of materials is inefficient . . , more so today than ever before. The CM Comet makes substantial savings in materials handling costs . . . is doing it every day in thousands of plants. Possibly the CM Comet can save a good many dollars for you too. Check up on the materials handling situation in your plant. CM Bulletin 138 . . . available for the asking . . . will bring you complete details about the Comet.

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(Affiliated with Columbus-McKinnon Chain Corporation)

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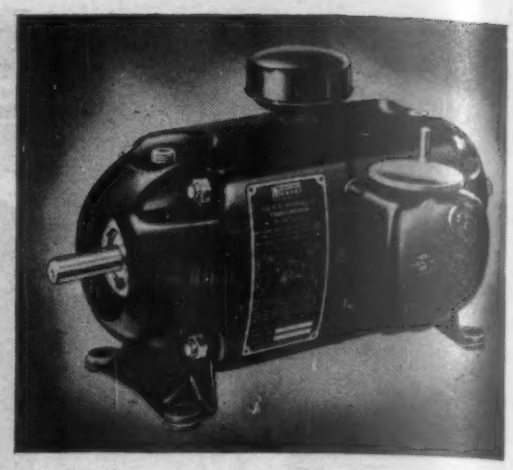
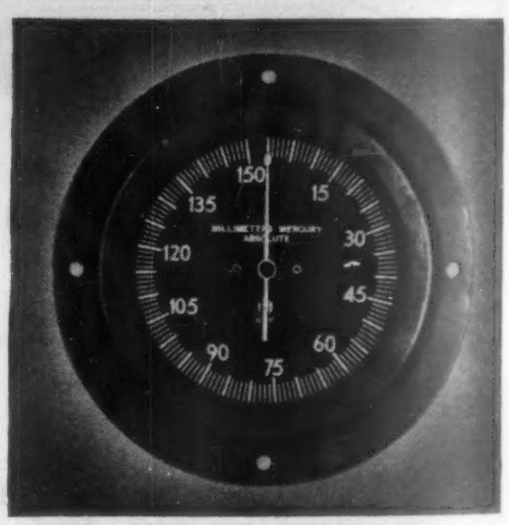


continuous duty, for fractional horsepower machinery drives. Features stepless speed adjustment from zero to maximum r.p.m. output in either direction of rotation. Full and constant torque power characteristics are maintained throughout the speed range. The input shaft may be driven in either direction without mechanical change. The unit may be stalled without damage, maker says, being equipped with automatic overload protection. Fingertip speed adjustment is obtained by either handwheel or servo control. Vickers Inc., 1592 Oakman Blvd., Detroit.

ABSOLUTE PRESSURE GAGE

Dial on pressure gage indicates, in units of inches or millimeters of mercury, the absolute pressure or vacuum to be



measured. The graduations are the same as used on barometers to measure atmospheric pressure. The gage can be built in a number of ranges to suit requirements, and furnished with a dial graduated to one complete turn of the pointer. The corrosion-resistant case is of black molded phenolic material. United States Gauge, Div. American Machine & Metals, Inc., Sellersville, Pa.

MAGNET HOLDING UNITS

Line of Alnico permanent magnet holding assemblies consists of five types in 17 sizes, ranging from a pull of 1½ to 500 pounds. They are vacuum impregnated to prevent moisture penetration and a consequent internal rusting, and are cadmium plated to prevent external corrosion. Stray magnetic fields do not affect the magnet assemblies, maker states, and the Alnico alloy will hold its life indefinitely. The line fea-

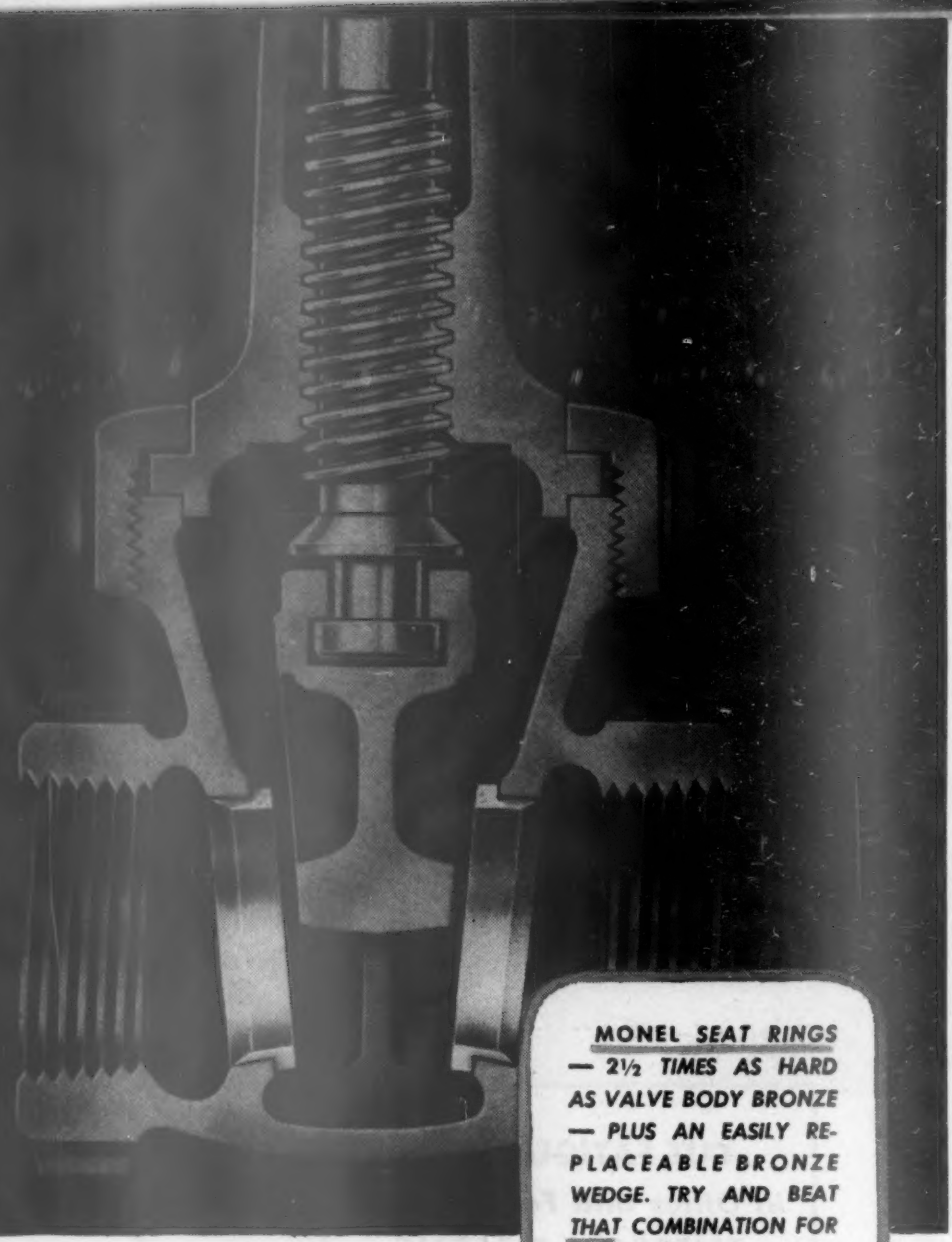
JENKINS GIVES YOU

Super Toughness

in the

"TROUBLE ZONE"

in the NEW FIG. 270-U
200 lb. BRONZE GATE



MONEL SEAT RINGS — 2½ TIMES AS HARD AS VALVE BODY BRONZE — PLUS AN EASILY REPLACEABLE BRONZE WEDGE. TRY AND BEAT THAT COMBINATION FOR LONG LIFE, LOW MAINTENANCE!

Plus....

IN the NEW Fig. 270-U Bronze Gate Valve, Jenkins engineers give you a practical design to checkmate trouble in the "trouble zone" — and cut maintenance to a new low.

Wear affects only the most accessible part — the bronze wedge — which can be replaced simply by slipping it off the stem and slipping on a new one. The seat rings, expanded in the body, are super-tough MONEL, for lifetime durability. Convincing tests, in toughest service, prove it the best seating combination to beat wear, reduce care.

Get complete details of this NEW Jenkins Fig. 270-U. See why it's your best buy in a 200 lb. Bronze Gate, especially for unusually severe conditions, such as in oil refineries, chemical, food, and rubber plants.

LARGE SPINDLE THREADS—Plenty of large diameter, sturdy threads reduce wear to a minimum, insure easy operation.

EXCEPTIONALLY RUGGED BODY, BONNET, AND BONNET RING — Withstand rough usage, shocks and hydraulic pressure far beyond rating.

DEEP STUFFING BOX — MORE PACKING—Keeps packing tight around spindle with less friction, permits spindle to be turned with less effort.

NEW FOLDER — Describes many other exclusive features that mean extra years of low-cost performance.

WRITE FOR THIS FOLDER. It describes the Fig. 270-U and many other popular Jenkins Bronze Gate Valves. Or, ask your Jenkins Distributor.

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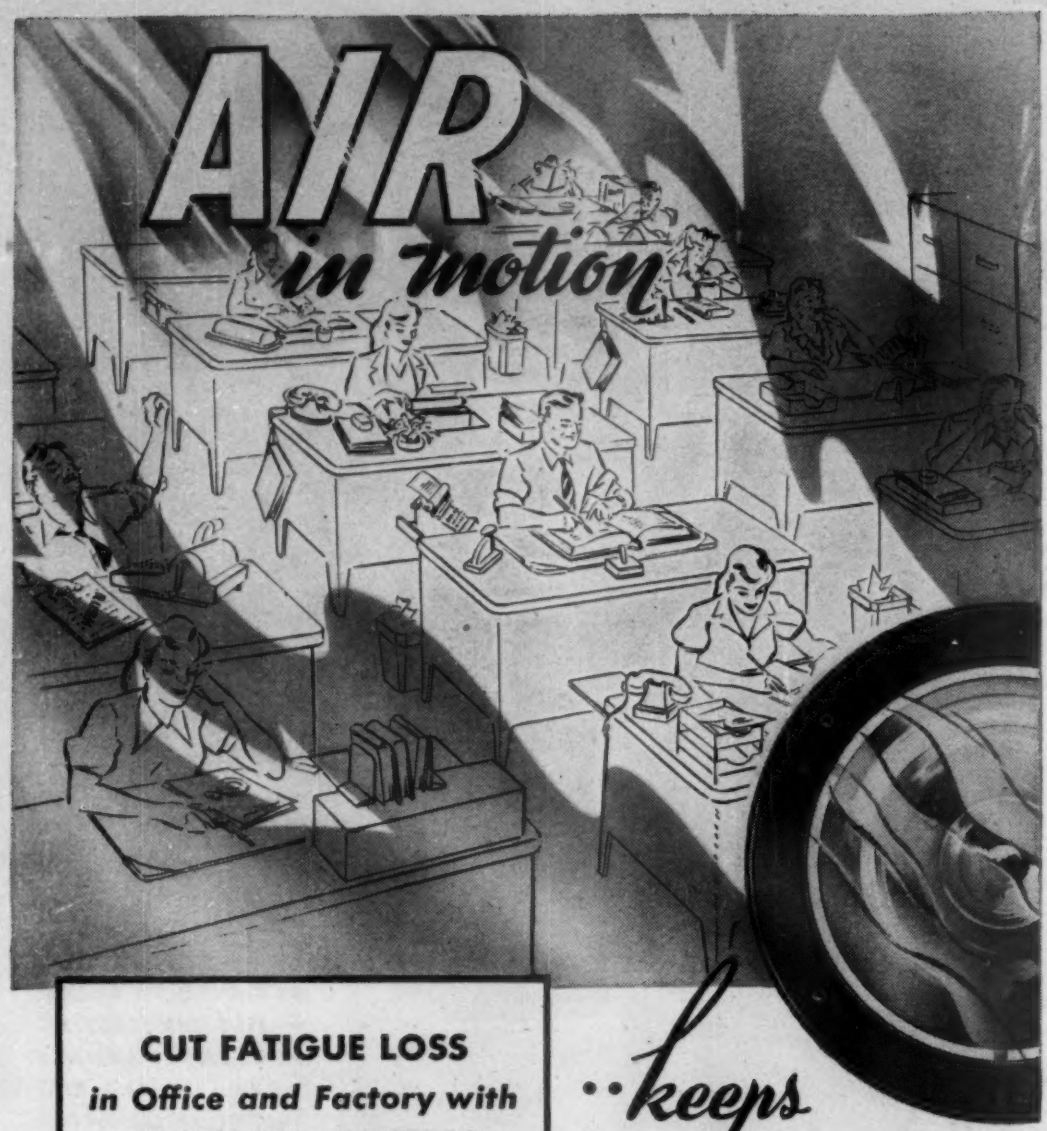
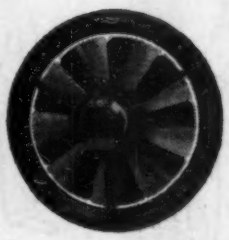


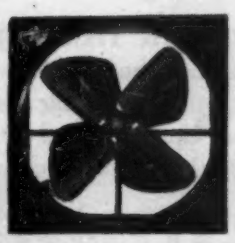
CUT FATIGUE LOSS
in Office and Factory with
EMERSON-ELECTRIC
Exhaust Fans

DIRECT-DRIVE



Five sizes, 12 to 30 in., powered with fully enclosed Emerson-Electric self-cooling motors, in ball-bearing and sleeve-bearing types. Quiet, efficient blades.

BELT-DRIVE



Powered by specially-engineered Emerson-Electric Motors, these sturdy fans move up to 16,700 C. F. M. Available in 24″, 36″, 42″ and 48″ sizes.

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MEN
in action

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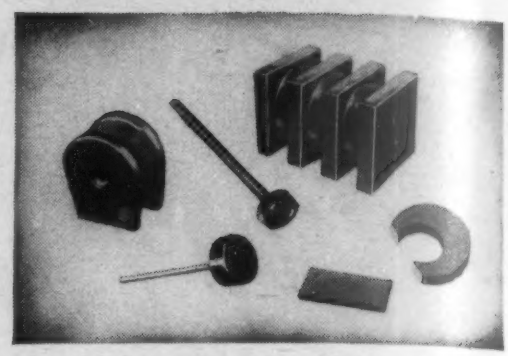


tures the "close flux" type in the cup, cup-stem, and horseshoe types for applications where the required holding force is through a zero air gap and an extended magnetic field is not required; and the "deep flux" type in the magnetic retriever and magnetic stand models, which possess a magnetic field extending to a greater depth than the close flux type. General Electric Co., Pittsfield, Mass.

ACID-RESISTANT APRON

Heavy-duty industrial apron made of clear Koroseal film, a flexible synthetic material, is resistant to acids, greases,

caustics, gasoline, animal and vegetable fats, solvents, and soaps. Made in two sizes, one 29x35 inches, weighing 14 ounces, and the other 35x45 inches, weighing 1½ pounds. The aprons are of tape, hem, and grommet construction, with all points of stress reinforced with a cloth insert covered with Koroseal film. The B. F. Goodrich Co., Akron.

HAND TACHOMETER

Designed to give accurate and direct readings of linear speeds from 10 to 10,000 f.p.m., and of rotational speeds from 100 to 10,000 r.p.m., hand-held electric tachometer weighs 3 pounds. Using accessories, rotational speeds from 10 to 100,000 r.p.m. may be measured. Applications include measuring cutting speeds. Speed ranges can be changed while the spindle is rotating, because there is no gear transmission to shift for various speed ranges. Low

(QUick Exchange)

WHEN the tool room is flooded with calls for the fast production of odd lots of work, you need an internal grinder that's a fast operator —one that can be set up easily and changed over quickly. You need a Bryant No. 112 Internal Grinder.

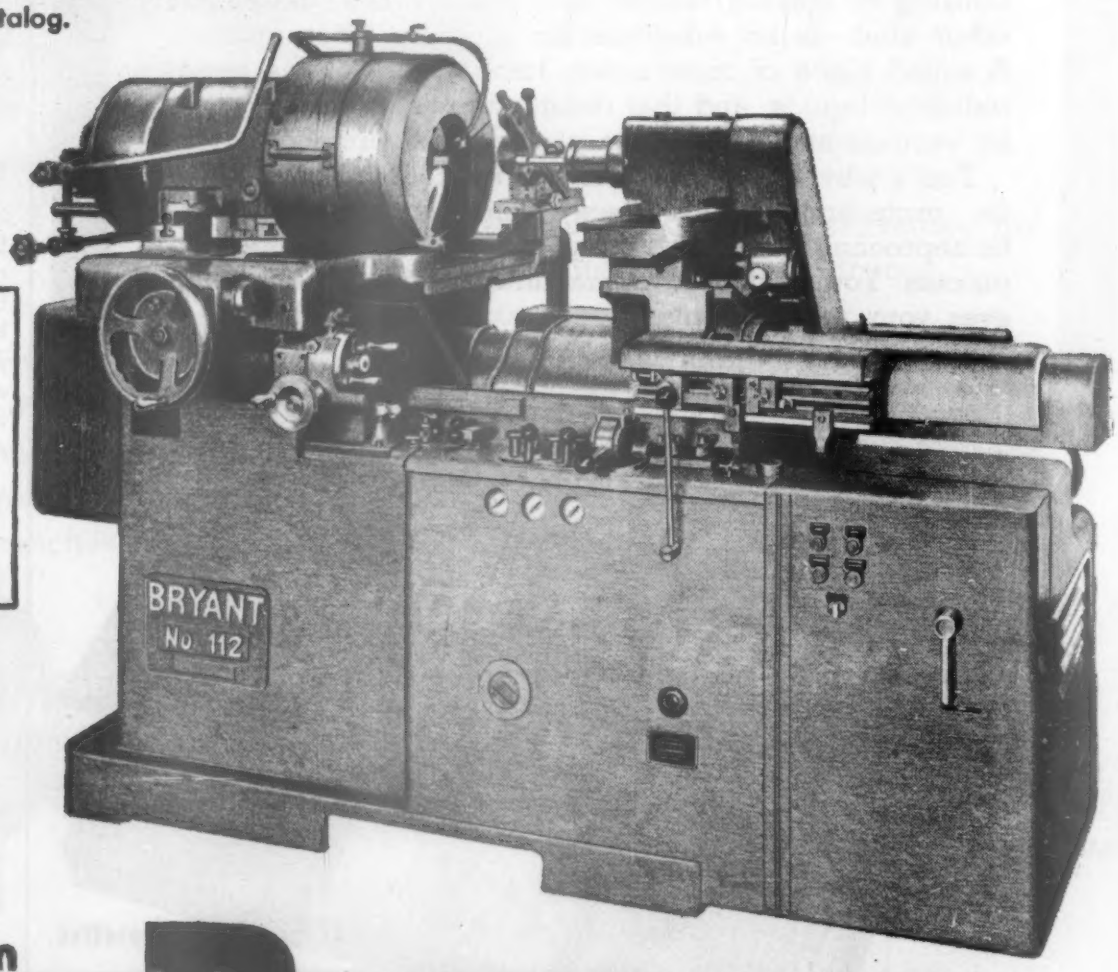
Quickly adjusted cycle controls for wheelslide—Selection of cycle phases either manually or automatically through main wheelslide control. Independent setting of wheelslide traverse for wheel dressing and grinding by two convenient hand throttles. Universal stop rod positions wheelslide for face grinding. Positive locking reversing dogs for setting grinding stroke quickly. Belt driven wheelheads; Hi-Frequency wheelheads for speeds up to 100,000 R.P.M.

Work spindle designed for operating efficiency—Rigid setting for taper grinding up to 90° included angle, provided by double circular slide mounting. Infinite spindle speeds from 100 to 1000 R.P.M. Quick interchange of chucks, holding fixtures and face plates provided by American Standard Type Cam Lock Spindle Nose.

Three cross-feed controls for versatility—Fast set-up provided by rapid traverse cross-feed. Increased output on long runs with power cross-feed control. Accurate size control through precision feed dial. These are the highlights that make set-up of the 112 simple and change-over fast. When combined with the basic features available in all Bryant grinders, they add up to less down time, more accurate work, finer work finish and faster production.

For more details on a fast operator that can handle more calls per day, just ask for the Bryant No. 112 catalog.

No. 112
HYDRAULIC
INTERNAL GRINDER



Send for the Man from

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U.S.A.

BRYANT

Dunking's good for doughnuts,

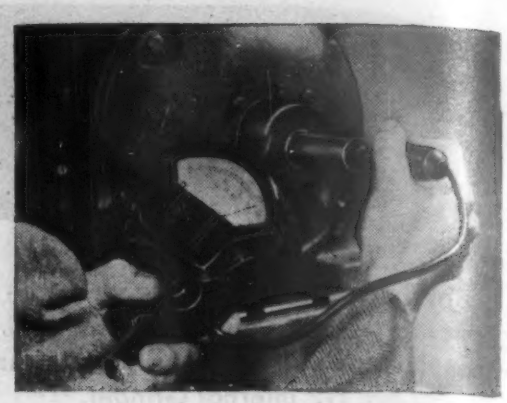
BUT DON'T DEPEND ON IT FOR WOOD

Dousing or soaking lumber in a preservative—no matter *what* kind—is no substitute for pressure impregnation. A sound piece of construction lumber *resists* the penetration of liquids, and that resistance has to be overcome by vacuum and pressure to provide real protection.

That's why American Lumber—whether Wolmanizing* for protection against decay and termites, Minalith-flameproofing*, or creosoting—uses only the pressure process. You're assured of maximum dependability whatever your requirements.

*Registered trademarks

1676 McCORMICK BUILDING, CHICAGO 4, ILLINOIS



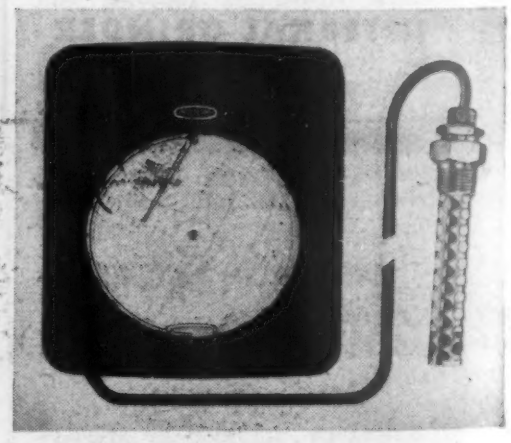
driving torque is ¼-ounce-inch. The instrument is said to be undamaged by overspeeding. Vibration from the rotating machine does not affect the reading. The tachometer can measure clockwise and counter-clockwise rotation. Special Products Div., General Electric Co., Schenectady 5.

DUST COLLECTOR

Mikro-Collector utilizes hard-pressed wool felt as a filter medium in industrial air and gas filtration. Clogged pores are prevented by jets of air, which keep the felt filter clean. Manufacturers claim 99.99 per cent minimum recovery of most solids, and the following filter rates: minimum, 8-cu. ft. per sq. ft. filter surface per minute; average, 20 cubic feet; maximum, over 30 cubic feet. Also that the collector handles dusts containing a high percentage of moisture or oil. In the standard single-bag collectors, the cylindrical felt bag is centered in an air-tight steel or aluminum housing. Units are also available with larger or multiple bags. Pulverizing Machinery Co., 167 Chatham Rd., Summit, N. J.

DEW POINT RECORDERS

Dew point recorders and recording controllers are adaptable to continuous dew point measuring in air conditioning, blast furnace operation, gas distribution, and other applications. The Dewcel measuring element is a perforated metal cylinder about 9 inches long and 2 inches in diameter. Different standard chart ranges are available,



two of which are −20 to +92 deg. F., and 36 to 160 deg. F. dew point. Of the two types of recorders, one is a Dynalog all-electronic instrument; the other is the liquid-filled system type, in a round-form case. Pneumatic or electric control systems, for the operation of

valves, dampers, or motors, can be sup-

No Substitute for Quality

There is no substitute for Quality — therefore no substitute for Bunting Bronze.

When you need Bearing Bronze, Quality Bearing Bronze, call the leading Distributor in your community—because—the leading Distributor in your community is, almost certainly, the Bunting Distributor. The Bunting Brass & Bronze Company, Toledo 9, Ohio.

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BRONZE BEARINGS

PRECISION BRONZE BARS

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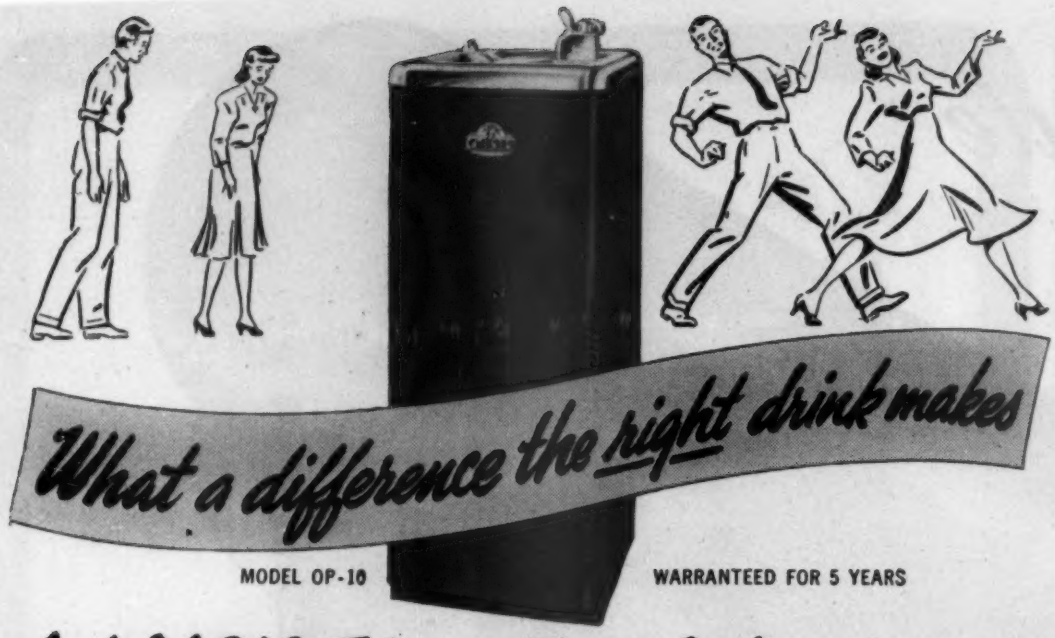

Let OASIS Electric Water Coolers prove it!

In any kind of work—mental or physical—*thirsty* employees aren't at their best. They're prone to accident or error, more irritable, less efficient. Your best insurance against these handicaps is to spot OASIS Electric Water Coolers *strategically*. The features built into OASIS by EBCO (world's largest maker of electric drinking water coolers) will pay you a two-way dividend—in greater thirst-satisfaction and lower-cost maintenance and operation. Let us send full details on OASIS coolers for your needs. Models and sizes to meet any condition. Write.

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Fast!
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DIAGRAPH-BRADLEY,
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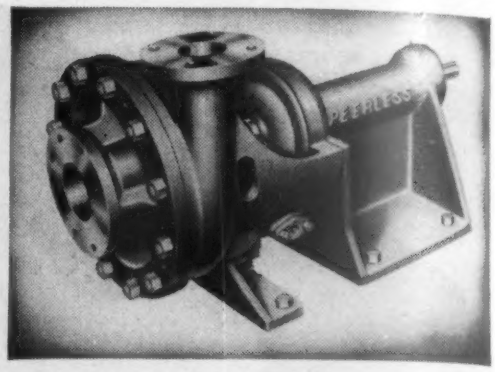
valves, dampers, or motors, can be supplied in either instrument. Can be installed indoors or outside. The recording instrument may be mounted as much as 600 feet from the measuring element. Current consumption is 1 to 8 watts. The Foxboro Co., Foxboro, Mass.

ACIDS-HANDLING PUMP

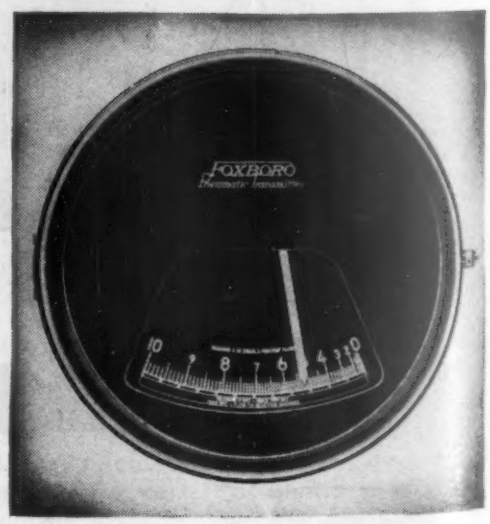
Centrifugal pump, designated Type ACO, is constructed for pumping corrosive fluids. Features integral casting of



the pump volute and drip pocket; any acid or caustic solution that leaks through the stuffing box drips onto corrosion-resistant material. A large inboard end cap of special alloy keeps the liquid away from bearing housing. The screw-type fitting in the drip pocket has been replaced by flange and two bolts, which can be made of stainless steel. The pump is of the single-stage, single-suction type, equipped with ball bearings handling capacities up to 600 g.p.m. against heads up to 200 feet. Peerless Pump Div., Food Machinery Corp., 301 West Ave. 26, Los Angeles 31.

PNEUMATIC TRANSMITTER

Transmitter Model 42 is for use in the pneumatic transmission of industrial process measurements such as flow, static or differential pressure, liquid level, temperature, or humidity. It is an indicator-type instrument, made with either an eccentric or concentric scale. Maker says the transmitting and receiving mechanisms are matched and perfectly linear in calibration, for improved accuracy in transmission and simplified calibration. Round-form 12-inch case is suitable for outdoor installations, or where protection from dust or fumes is essential. Size permits better



SOLVED!

THE COMPLEX PROBLEM OF

INVENTORY CONTROL

Certified protection against fire at point-of-use. These four Floor Model Safe-Kardex units protect the Frank D. Palmer materials control record twenty-four hours a day. Each unit may be wheeled to any part of the office for maximum working convenience.

At
Frank D Palmer Inc
Chicago

A TOUGH CASE? Yes, but it cracked in a hurry when a Remington Rand system was applied to the inventory control requirements of this famous machinery manufacturer.

As producers of highly individualized packaging equipment, Frank D. Palmer, Inc. are faced with material and tool control problems far more intricate than those of companies making standard products. Not for just one but for *every* customer's order, they must know and anticipate:

- WHAT TO ORDER
- WHEN TO ORDER
- HOW MUCH TO ORDER
- FROM WHOM TO ORDER
- HOW MUCH IS ON HAND
- HOW MUCH IS RESERVED FOR ORDERS IN PROCESS
- HOW MUCH REMAINS DUE

Similar problems apply to their procurement of tools. Many are specially made—and costly. Rigid control must be maintained on allocations, both to jobs and to individual workers. Excessive breakage or loss of valuable tools must be quickly traced and corrected.

Heart of their System—Visible Records

PALMER'S MATERIAL CONTROL is now set up in a Kardex system that provides a four-year history of usage, vendors, and prices as well as current balances—with all facts on each item centralized in a single visibly-indexed pocket. The Graph-A-Matic signal on the visible margin flashes prompt warning when executive review is required of materials on hand, on order, reserved or past due.

At the same time, the tool record provides positive control over usage, breakage and loss, based on the same Kardex *visible* principle—with an additional provision for filing tool *charge-out* slips in the record pocket.

With this scientific system Palmer avoids excessive investment in inventory—yet makes certain that sufficient stocks are on hand, when required for production.

Whether *your* inventory involves thousands of items or relatively few, Remington Rand visible systems bring you closer, more economical control, faster posting, easier reference and lower clerical costs.

For more facts on how to solve your particular inventory problems, telephone your nearest Remington Rand office or write: Systems Division, 315 Fourth Ave., New York 10, N. Y.

Remington Rand

THE FIRST NAME IN BUSINESS SYSTEMS

Building for Better Service

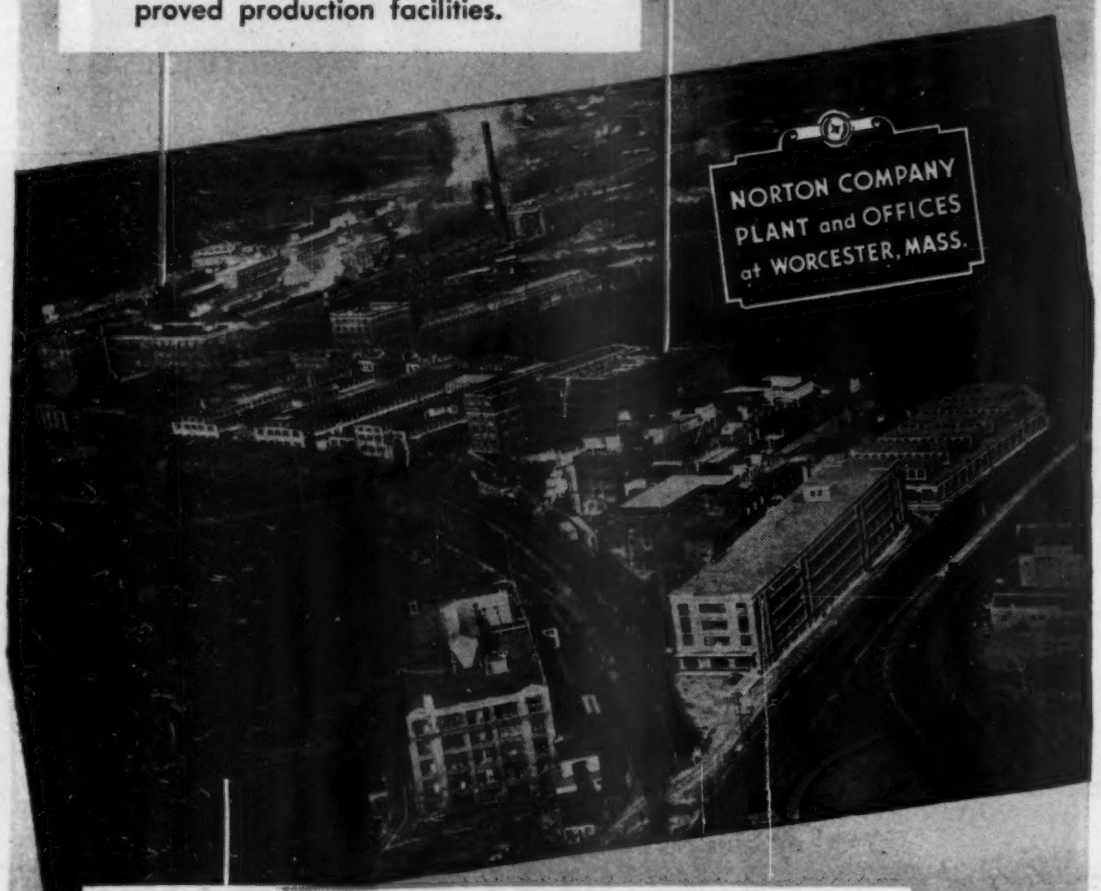
At the main Norton Worcester plant — a mile and a quarter long — you'll find much construction work in process — new buildings going up, present facilities being improved. Three major projects at the moment are:

OFFICE SPACE INCREASED 44%

Speedier handling of orders is assured by a 36,000 square foot addition to the main office building.

IMPROVED MANUFACTURING FACILITIES FOR REFRACTORIES

The refractories plant is being rebuilt to give this important and rapidly growing Norton division improved production facilities.



NEW GRINDING WHEEL PLANT

The manufacture of vitrified grinding wheels will be greatly speeded up and improved by this entirely new plant. Covering nearly five acres it will cost, complete with equipment, over $3,500,000.

And at the Norton warehouses, too — large additions in Chicago and Philadelphia—improved facilities in Detroit.

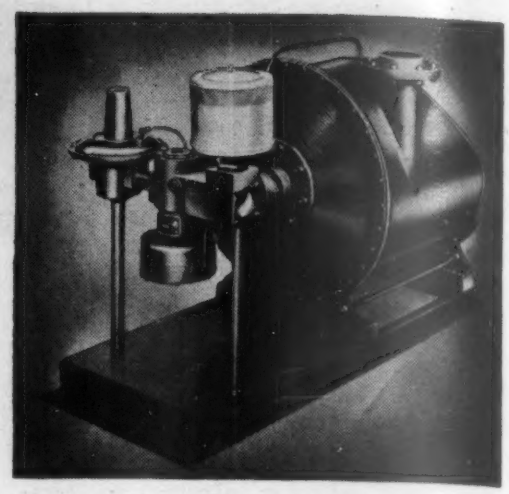
NORTON

ABRASIVES — GRINDING WHEELS — GRINDING AND LAPPING MACHINES
REFRACTORIES — POROUS MEDIUMS — NON-SLIP FLOORS — NORBIDE PRODUCTS
LABELING MACHINES (BEHR-MANNING DIVISION: COATED ABRASIVES AND SHARPENING STONES)

location of the instrument parts, facilitates field servicing, and provides room for additional units, such as alarm or signal devices. The Foxboro Co., Foxboro, Mass.

GAS-AIR MIXER

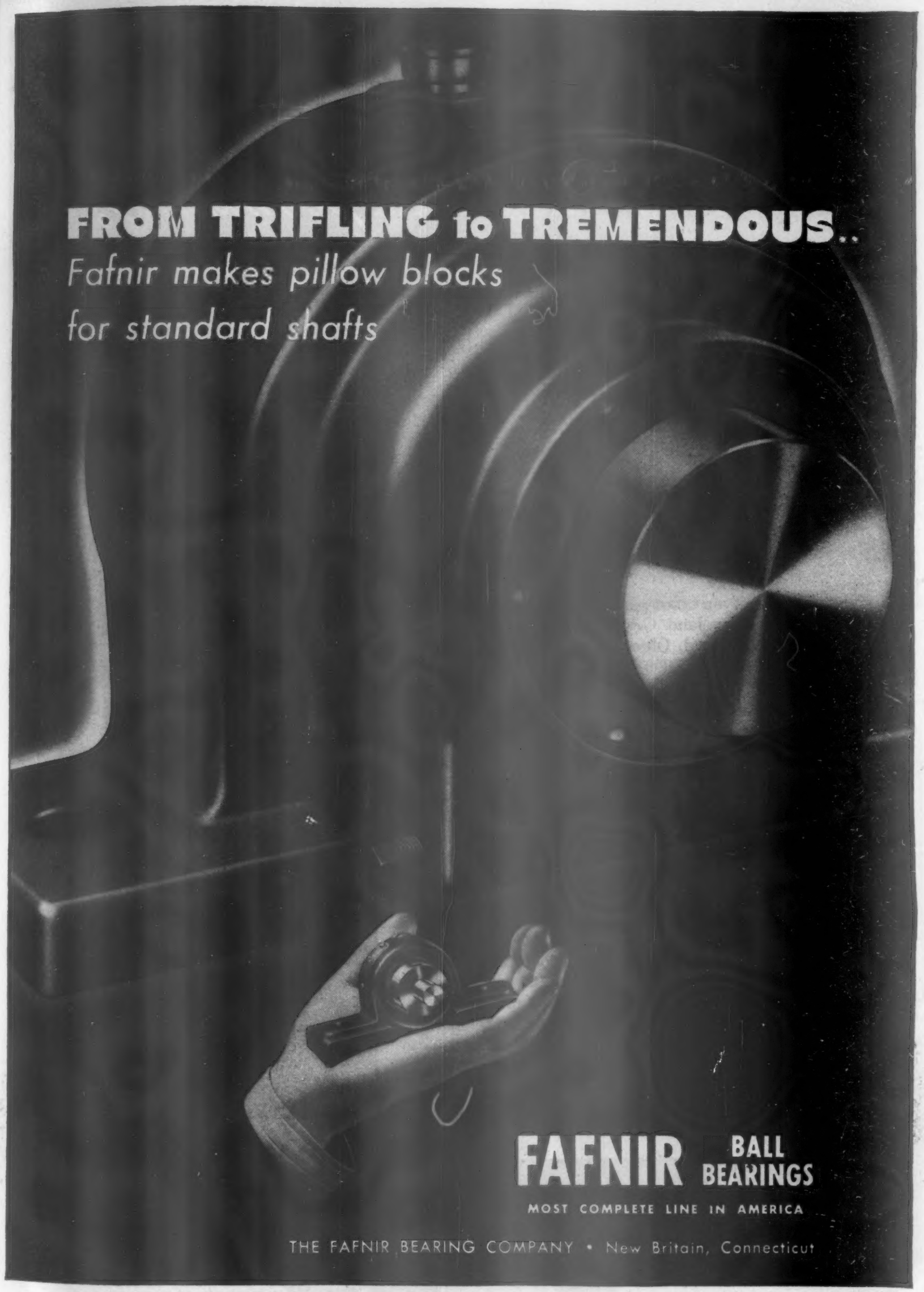
Operation is variable in gas-air mixer made in models providing mixture capacities from 3000 to 18,000 cubic feet



per hour. Designed to pre-mix natural, manufactured, or liquid petroleum gases with air in any proportion and quantity desired in the capacity of the unit. The mixture is then delivered to the burners under constant pressure. Controlled combustion mixtures for all types of heating processes are claimed, as well as close temperature control, high heat input, wide turn-down range, high burner pressure, and any desired flame characteristic. Piston and valve operation can be checked through an inspection window in the air inlet. Discharge pressures range from 28 to 32 ounces, with 3500 r.p.m. for all five models. Gas Appliance Service, Inc., 1211 Webster Ave., Chicago 14.

LIQUID LEVEL INDICATOR

Known as Gagetron, an electronic instrument utilizes gamma rays to determine liquid level in storage and process vessels. Has no connections originating inside the containing vessel. Used in conjunction with the Brown Electronik recording controller, it provides a means of remote, continuous liquid level indication and control. The instrument consists of (1) a gamma ray detector placed on the exterior of the containing vessel, and (2) a gamma ray source placed inside a corrosion-resistant float held by guides on the surface of the liquid directly below the detector. The gamma rays striking the detector (a counter of the Geiger-Mueller type) set up minute electrical pulses which indicate the distance between the source and the counter, and thereby the liquid level. An a.c. power supply rectifies and supplies the d.c. voltages necessary for the electronic circuit. The unit is designed for operation on 90-110-volt, 50/60-cycle, a.c. power; power consumption of the unit is approximately 75 watts. Engineering Laboratories, Inc., 624 East 4th St., Tulsa 3.


FROM TRIFLING to TREMENDOUS..
Fafnir makes pillow blocks
for standard shafts
FAFNIR BALL BEARINGS
MOST COMPLETE LINE IN AMERICA
THE FAFNIR BEARING COMPANY • New Britain, Connecticut

A nearby FAFNIR Distributor will help you solve any power transmission problem.

1,900,000 Cubic Feet of FIBERGLAS*-FILTERED AIR per minute!

A complete change of air takes place every two minutes at this prize-winning Cleveland Graphite Bronze Company plant, located in Cleveland, Ohio. The ventilating system in this huge plant draws 1,900,000 cubic feet of air per minute through 8" thick packs of Fiberglas fibers in the air washer, providing clean, filtered air for the entire plant. The system, designed by Air & Refrigeration Inc., New York, has been in operation over 5 years and the packs of glass fibers have not required replacement.

The inherent characteristics of Fiberglas fibers account for their use by the leading makers of equipment for air washing, evaporative cooling, humidifying and dehumidifying.

The fibers are, in fact, long, fine "rods" of glass—inorganic, non-cellular, non-absorbent, non-odorous. And the pack presents an unusually large surface area for liquids—this being the key to higher efficiencies.

Fiberglas packs also are used as eliminator mats on the discharge side of washers or spray chambers to gather any free particles of water entrained in the air stream.

Make certain that the new units for your system are equipped with Fiberglas packs. The names of the manufacturers of this equipment will be furnished on request . . . Write Owens-Corning Fiberglas Corporation, Dept. 861, Toledo 1, Ohio. Branches in principal cities.

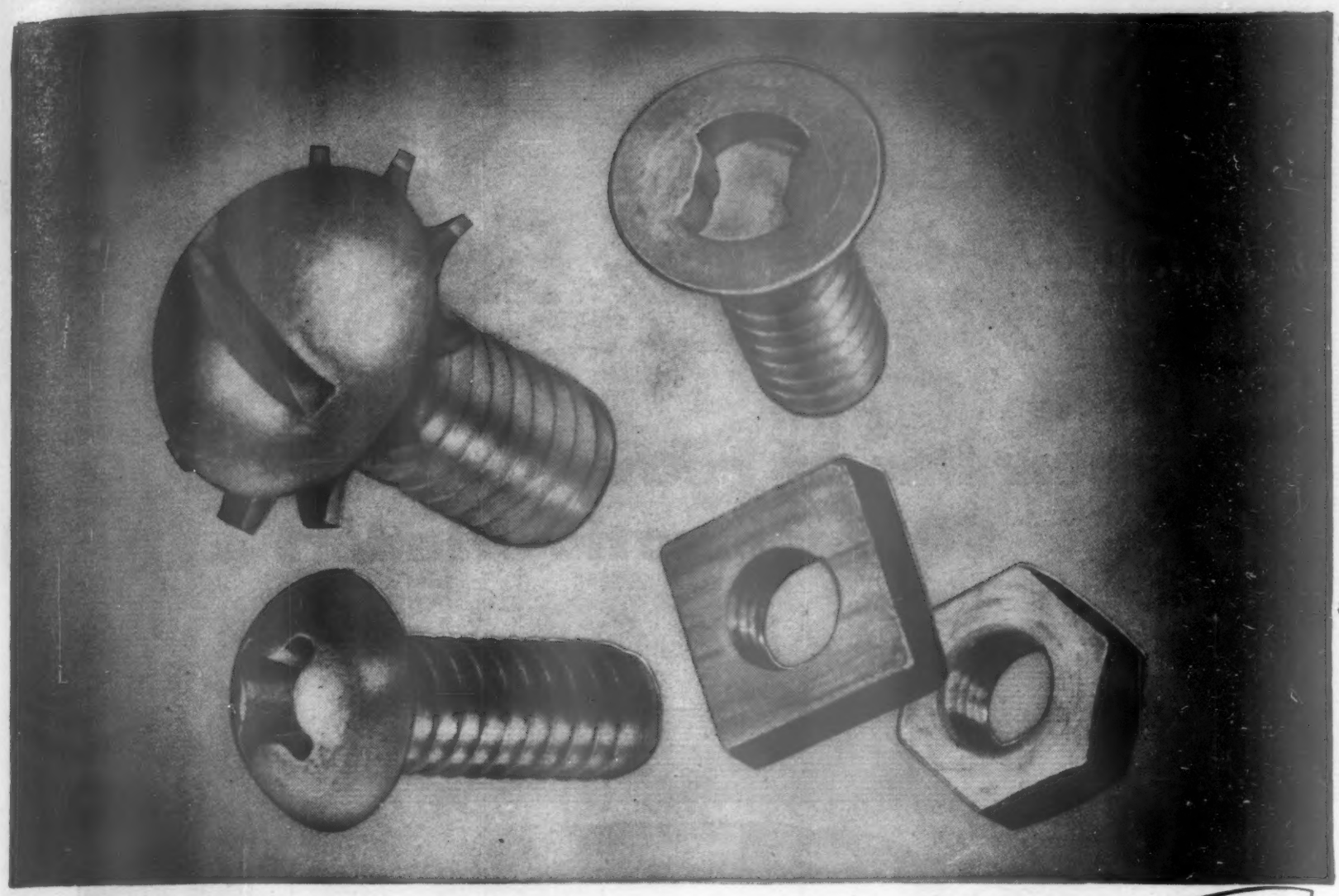
In Canada: Fiberglas Canada Ltd., Toronto, Ontario.

OWENS-CORNING
FIBERGLAS

GLASS FIBER PACKS . . .
For Air-Washing, Cooling, Humidifying and Dehumidifying Units

"DUST-STOP" AIR FILTERS . .
The Low-Cost, Replacement-Type Filter for Heating, Ventilating and Air-Conditioning Systems (write for booklet A5.2.1)

***FIBERGLAS is the trade mark (Reg. U. S. Pat. Off.) for a variety of products made of or with glass fibers by Owens-Corning Fiberglas Corporation.**



WHEN YOU CAN *COUNT* ON EVERY FASTENER... THAT'S **t.f.e.** True Fastener Economy!

It's the cost of using a fastener that counts

The saving you can make by being able to depend upon your supplier's "quality control" and by reducing inspection in your own plant, invariably amounts to a greater saving than could be effected if a lower price were available.

R B & W *Machine Screws and Stove Bolts Made to One Quality Standard*

At each RB&W plant, quality control is effective at every stage of manufacture—beginning with laboratory analysis of raw materials—*not* just at the end of the production line. The finished product that is delivered to you can be depended upon for uniformly high qualities—giving you a fastening device that assembles at high speed, provides maximum desired holding power and, in terms of finish, is a credit to the appearance of your assembled product.

You Get T. F. E. *When You*

1. Reduce assembly time to a minimum by savings through use of accurate and uniform fasteners
2. Make your men happier by giving them fasteners that make their work easier
3. Reduce need for thorough plant inspection, due to confidence in supplier's quality control
4. Reduce the number and size of fasteners by proper design
5. Purchase maximum holding power per dollar of initial cost, by specifying correct type and size of fasteners
6. Simplify inventories by standardizing on fewer types and sizes of fasteners
7. Save purchasing time by buying larger quantities from one supplier's complete line
8. Contribute to sales value of final product by using fasteners with a reputation for dependability and finish

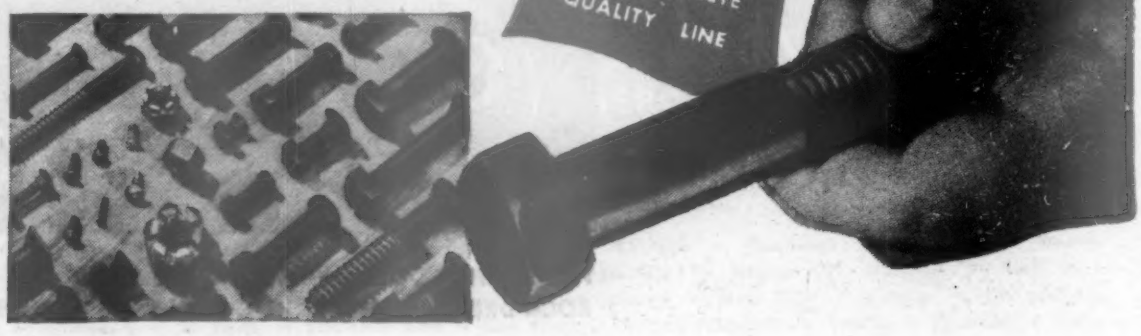
RUSSELL, BURDSALL & WARD BOLT AND NUT COMPANY

102 years making strong the things that make America strong

RB&W bolts, nuts, screws, rivets and allied fastening products are manufactured in a broad range of styles, sizes and finishes.

• • •

Plants at: Port Chester, N. Y., Coraopolis, Pa., Rock Falls, Ill., Los Angeles, Calif. Additional sales offices at: Philadelphia, Detroit, Chicago, Chattanooga, Portland, Seattle. Distributors from coast to coast. By ordering through your distributor, you can get prompt service from his stocks for your normal needs. Also—the industry's most complete, easiest-to-use catalog.



Introducing

new line of heavy duty CP Pneumatic Grinders

for maximum removal of metal—with low maintenance

Steel clad spindle and motor housings—lightweight steel tube construction can take rough handling . . . resists wear and tear.

Constant speed governor—holds wheel at most efficient cutting speed, from no load to full load . . . eliminates danger of over-speed when running free.

Movable exhaust ports—can be revolved to any desired position and locked.

Easy action throttle valve—takes the jerk out of starting.

Multiple disc air cleaner—offers no resistance to air flow.

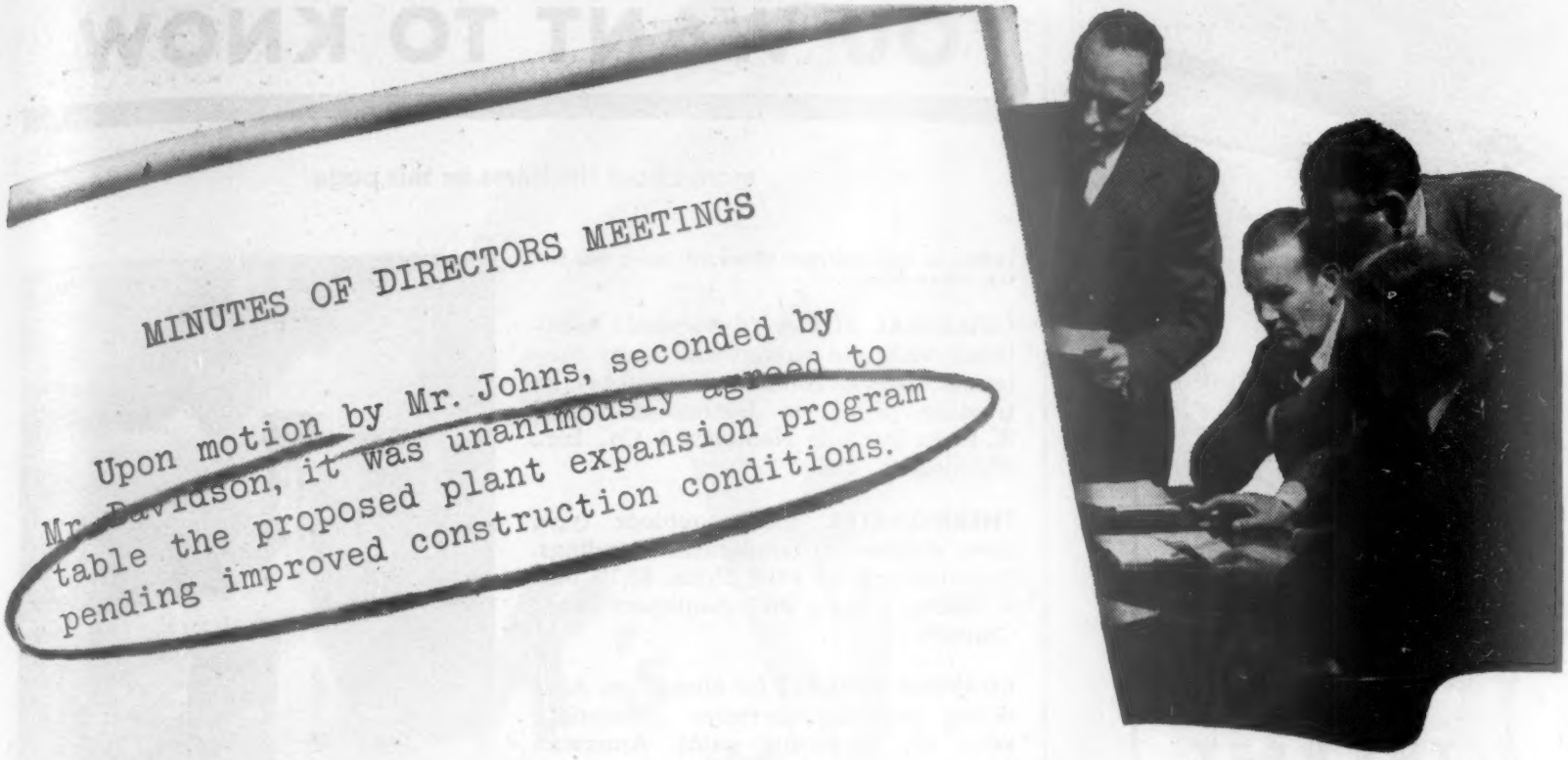
Built-in lubricator—large capacity reservoir . . . trouble-free, non-clogging, porous wick system.

Available in wide range of models for 4", 6", and 8" diameter wheels, with speeds from 2000 to 9000 R.P.M. Straight or pistol grip handles; 20" and 35" extensions; wire brush attachments, etc. Write for Bulletin SP—2068.

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES


MINUTES OF DIRECTORS MEETINGS
Upon motion by Mr. Johns, seconded by
Mr. Davidson, it was unanimously agreed to
table the proposed plant expansion program
pending improved construction conditions.

You don't *have* to do that, Gentlemen...

INVESTIGATE READY-BUILT, READY-TO-OCCUPY PRODUCTION FACILITIES AVAILABLE NOW

To be sure, building materials *are* still short. Equipment deliveries *are* delayed. Other new-construction "headaches" continue to interfere with plant expansion plans, branch manufacturing or distribution relocation programs and the establishment of new enterprises.

But many industrialists and management executives have found a practical way to carry out their plans. They have solved their problems by purchase or lease of Government-owned industrial facilities . . . at money-saving prices.

Hundreds of good, usable, strategically-located plants and properties are available now. Small-town plants down South, big-city establishments in the Midwest, land and buildings on Atlantic, Pacific and Gulf coasts. One or more of these may be just right for you, or readily and economically adaptable to your needs.

So, before you "table" your plans, investigate the facilities ready and waiting for you to bid on today. Check the offerings listed in the new Plantfinder—consult our nearest office for further information.

NEW PLANTFINDER—FREE... Describes immediately available properties—lists others soon to be made available—indexed, cross-indexed for your convenience. Write for free copy—to the address listed below, on your company letterhead, please.

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HOLDEN LINE CO.
Pioneers in Fluorescent
2301 SCRANTON ROAD
CLEVELAND 13, OHIO

YOU WANT TO KNOW

more about the items on this page

Letters to the addresses given will bring you further information.

COLLOIDAL SILICA (fluid sand) combines with and strengthens many materials. Used in compounding rubber, in treating paper, in leather dressings. E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

THERMOMETER, indoor-outdoor type, gives differential temperature readings. Baked enameled case. Price, $6.75. Jas. P. Marsh Corp., 2073 Southport Ave., Chicago 14.

COATING PROCESS for aluminum. Alodizing provides corrosion protection; bond for anchoring paint. American Chemical Paint Co., Ambler, Pa.

DIP STICK, separate calibration plate for reading tank content level. Aluminum. To specification. Roylyn, Inc., 718 West Wilson Ave., Glendale 3, Calif.

WAX FINISH, pre-cure type, for molded, extruded, calendered rubber products. Prevents sticking in storage; serves as mold release. Gives dry, satin finish to surface. Johnson's Wax Co., Racine, Wis.

POWER HOIST on aluminum ladder-like tracks which curve at top to deliver load inside work area. Carries 500 pounds 80 feet per minute. Used on lifts from 12 to 25 feet. Campbell Equipment Co., 6643 Ridge Ave., Chicago.

CALENDAR, in color, spiral bound, large dates. Weekly wall type. Free. The Frederick Post Co., P. O. Box 803, Chicago.

RUST PREVENTIVE. Sova-Kote 203 for inter-operational protection of machined parts. Socony-Vacuum Oil Co., Inc., 26 Broadway, New York 4.

GAUZTAPE, adhesive, oil resistant, designed to protect hands from burns, abrasions. Can be applied to protect items which must be kept clean. Sizes — 1 in. x 15 yds.; 2 in. x 10 yds., or cut to order. Modern First Aid Necessities Co., 737 Randolph St., Chicago 6.

MICROSCOPE, pen size, adjusts to 40, 50, 60 power. Nickel finish, leather case. Price, $18.50. E. W. Pike & Co., Elizabeth, N. J.

METALS COMPARATOR for quick, non-destructive comparison of metal parts with a standard. Electronically tests 1500 parts per hour. General Electric Co., Schenectady 5, N. Y.

THREAD COMPOUND said to prevent freezing, galling of metal surfaces at temperatures up to 1800 degrees F. Data sheet and free sample. Felt Products Mfg. Co., Dept. P. 17, 1504 Carroll Ave., Chicago 7.

CALCULATOR simplifies sequential sampling. Tells how many samples needed, how long to sample, whether to accept or reject lot. Lightning Calculator Co., 496 Atlantic Ave., Brooklyn.

STORIES OF STEEL, mass production, and mass assembly, told in colored cartoon pamphlet. Given to school children visiting plant. Ford Motor Co., Dearborn, Mich.

PACKAGING FILM of Geon latex. For food, other items. Used on automatic packagers. Resists moisture, vapor transmission. Colored or transparent. Reynolds Research Corp., Gary, Ind.

METALS ANALYZER uses X-ray diffraction technique. Non-destructive. Gives percentage of any four components present at one setting. North American Philips Co., Inc., 100 East 42d St., New York 17.

WOODWORKING GLUE. Quick-setting, cold, liquid type. Comes ready for

Model 900,
3 h.p.

this powerful new

INVINCIBLE Vacuum Cleaner

● This rugged vacuum cleaner offers industrial users heavy duty performance, yet it is more compact and much lower in price than larger machines. Model 900 completely rounds out the Invincible line.

Model 900 is available with AC or DC motors, and has a 3-stage turbine type vacuum producer. Filter area, 3600 sq. in.; dirt container capacity, 3 cu. ft.; Height, 54½"; Length, 47½"; Width, 23"; Weight, 450 lbs.

Model 900 withstands continuous use, month after month, removing dirt and dust from every part of the plant. Also valuable in production applications to remove, reclaim or convey scores of industrial materials.

Write for complete information!

INVINCIBLE FACTS

- Over 100,000 units in service.
- 5,000 units in service for 25 years or more.
- 18 models, from ½ H.P. to 5 H.P.
- Backed by over 40 years' specialization in vacuum cleaning.

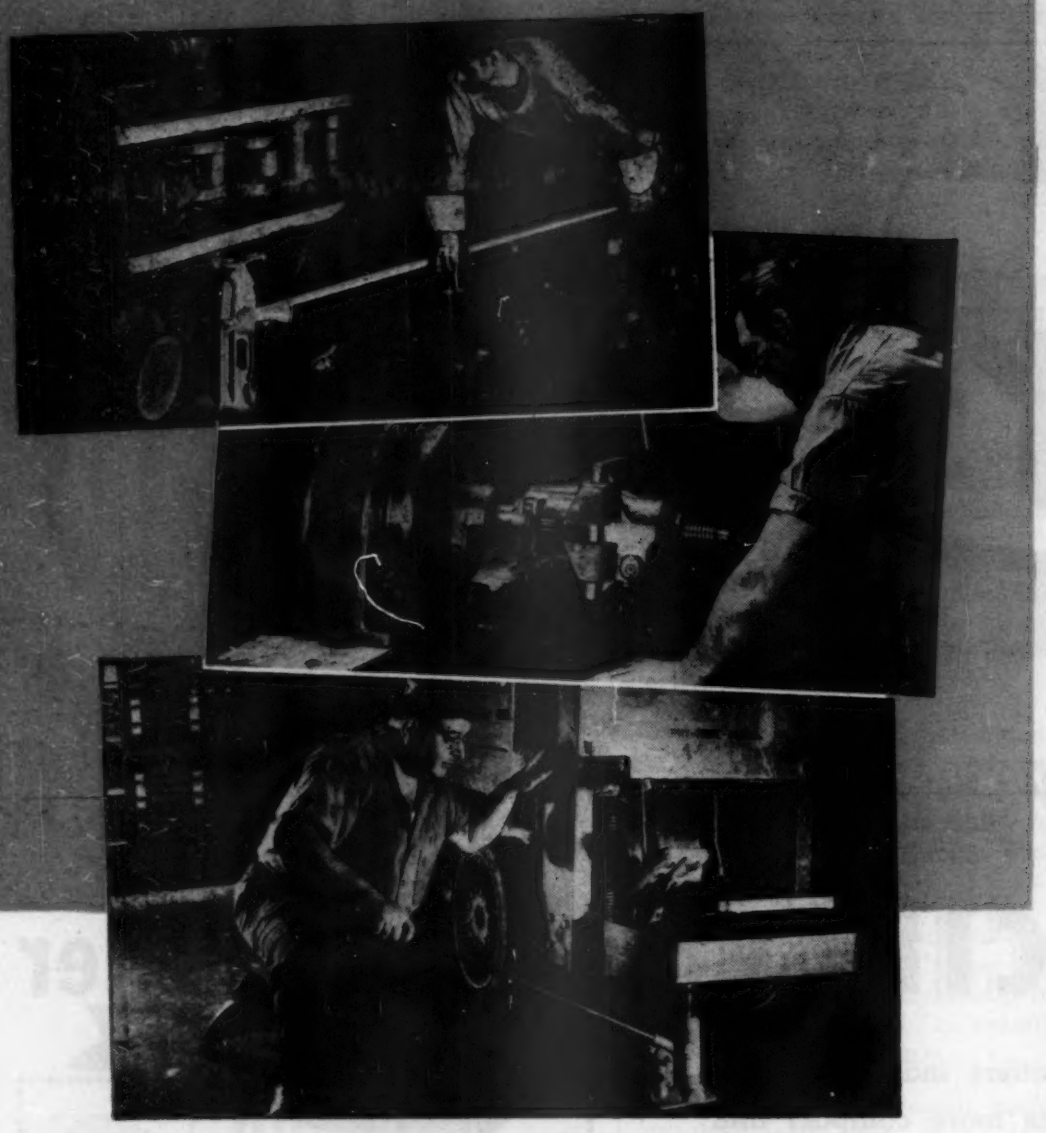
FREE BOOKLET
tells all about Invincible Machines for industry. Write for it!

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

FOR 40 YEARS, LEADERS IN INDUSTRIAL VACUUM EQUIPMENT

DUFF-NORTON JACKS

Do Special Jobs . . . all around the Plant



DUFF-NORTON JACKS

mean economy of Time, Labor and Costs

Lifting, lowering, pushing or pulling heavy machinery and other heavy loads is easy and economical—if you have the *right* jack for the job.

Duff-Norton's complete line enables you to select the proper jack as to lifting capacity, lifting speed, height, raise, weight, indoor or outdoor applications; for use in close quarters, with or without foot lift feature.

Your nearest Industrial Distributor will help you choose the Duff-Norton Jack best suited to your application. Write today for Catalog 203A.

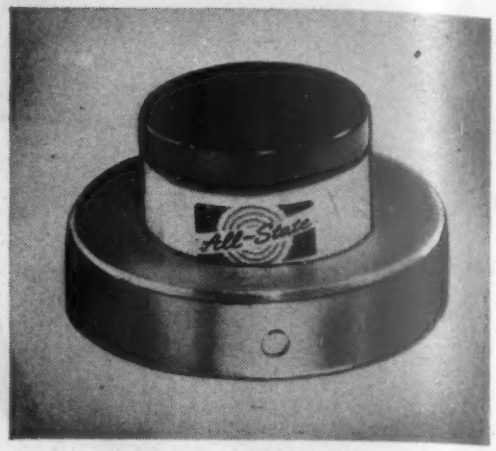
THE DUFF-NORTON MANUFACTURING CO.

PITTSBURGH 30, PENNA.

There is a Distributor Near You

use. Resists moisture, heat, cold. Sands easily, dries transparent. Midland Glue Products Co., 1478-88 Madison Ave., Detroit.

SCHOLARSHIP PROGRAM for engineering students. Awards for best papers on arc welding. Contest closes May 15, 1948. Sponsor, The James F. Lincoln Arc Welding Foundation, Cleveland 1.

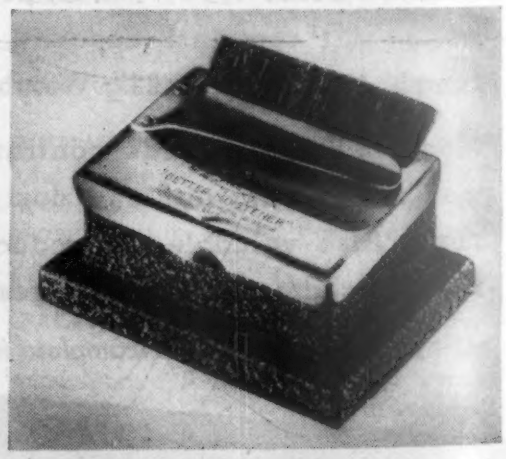


SILVER-BRAZING alloy in dispenser that simplifies brazing operations. Recessed pocket in aluminum container holds flux. Lengths, 10, 20 feet. All-State Welding Alloys Co., Inc., 96 West Post Rd., White Plains, N. Y.

CALCULATOR figures voltage drop on any size busduct. Free. Apply on letterhead. Frank Adam Electric Co., P. O. Box 357, St. Louis.

BOOKLET outlines procedures for watchmen to follow in handling fires. Question—answer, cartoon method develops eight fundamentals. Page for recording names, phone numbers of plant officials. Associated Factory Mutual Fire Insurance Companies, 184 High St., Boston 10.

BOOKLET explains Federal Old Age Benefit System in simplified form. Gives answers to primary questions. Provides detailed interpretations of system. Prepared for employee distribution. Industrial Equities, Inc., 141 West Jackson Blvd., Chicago 4.



LABEL MOISTENER, black wrinkle finish, chromium cover, rubber-padded base, 3-in. adjustable brush. E. W. Pike & Co., Elizabeth 3, N. J.

THE AMERICAN STATISTICIAN, replacing the *ASA Bulletin,* carries articles on application of statistics in business,

Illustrated: Electromode Suspension Type Heaters

Only ELECTROMODE Can Give SAFE Electric Heat Anywhere In Your Plant

ELECTROMODE Unit Heaters have no exposed hot, glowing wires; thus they may be used safely *anywhere*. The patented Safety-Grid—a heating element insulated and embedded within a finned aluminum casting—supplies abundant fan-driven warmth. As auxiliary heat sources, Electromodes pay for themselves during changeable weather . . . give quick warmth *locally* while the main heating plant is shut down or banked. They save the cost of operating boilers when only certain departments need heat.

There are Electromodes for every industrial purpose—1.5 to 60 KW. Also portable and built-in heaters for home, office. Approved by Underwriters' Laboratories. Ask your electrical supplier for sizes to meet your needs, or write Electromode Corporation.

Send for this new booklet on Industrial Heating, and Heating Analysis Form. Address Dept. F-127.

Heavy-Duty Combination Portable and Suspension Type Heater. May be plugged in wherever heat is needed. Capacities: 3 to 7.5 KW.

1.5 KW Combination Portable and Suspension Type Heater. Light and compact, it is ideal for heating small areas such as guard houses, factory offices, etc.

ELECTROMODE
All-Electric UNIT HEATERS

World's Leading Exclusive Manufacturer of All-Electric Heaters

ELECTROMODE CORPORATION • 45 Crouch Street, Rochester 3, New York

FOR THE UTMOST IN RUST PREVENTION

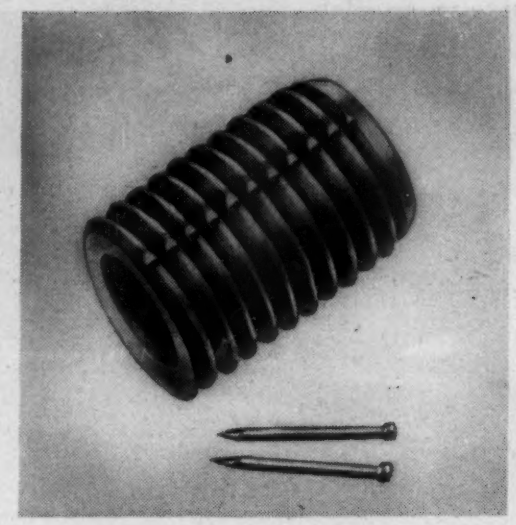
HOT-DIP GALVANIZE STEEL SASH

Architects and Engineers, more and more, specify the use of protective zinc coatings for the *utmost protection* to metal components of all types of exposed structures.

The American Hot Dip Galvanizers Association have established and are pledged to follow the highest standards in Hot-Dip Job Galvanizing. They assure the highest quality of workmanship, the best in materials, and employ the newest and most modern methods.

The collective know-how of the entire membership is available to you through the member whose location can best serve you. For membership roster write the Secretary, American Hot Dip Galvanizers Association, First National Bank Building, Pittsburgh, Pa.

hot-dip GALVANIZING



SELF-TAPPING INSERTS provide threads for molded, soft parts. Use in metal, wood, plastic. Locking feature. Roylyn, Inc., 718 West Wilson Ave., Glendale 3, Calif.

industry, etc. Question, answer column. American Statistical Assoc., 1603 K St., N. W., Washington 6.

SALVAGE SERVICE for worn rubber, metal covered industrial rolls. Resurfaced with new metal. Rodney Hunt Machine Co., Orange, Mass.

MOISTURE METER, battery operated, measures resistance to electric current. Readily calibrated to most materials. Gives per cent moisture up to 50. Thwing-Albert Instrument Co., Penn St. & Pulaski Ave., Philadelphia 44.

COMPUTER of corrosion resistance for 13 non-ferrous and stainless steel alloys in 142 applications. Slide rule type. H. M. Harper Co., 2620 Fletcher St., Chicago.

FILMS:

Industrial Lighting, sound-slide film, illustrates factors involved in typical problems. Price, $12. *Cost and Maintenance of Lighting,* sound-slide film, illustrates cost factors in design, operation of lighting systems. Price, $12. Westinghouse Electric Corp., 306 Fourth Ave., Box 1017, Pittsburgh 30.

Grinding Carbide Tools; The Diamond Wheel, Its Care and Use. Bookings available on month's advance notice. Running times — 26 and 18 minutes. Norton Co., Worcester 6, Mass.

A Fair Wage By Job Evaluation, sound-slide film, in color. Shows job evaluation methods, purposes, advantages to employee, applicable to all plans. Key characters animated. Thadene Hayworth & Assoc., 5855 Hollywood Blvd., Hollywood 28.

Watts in Glass, color. Illustrates uses of Fiberglas electrical insulation material. Demonstrates why use results in improved operation, lower maintenance costs. Owens-Corning Fiberglas Corp., Toledo 1.

It's Your Money, sound, 16 mm. Analyzes materials handling systems in 20 plants. Shows dozens of ways to reduce handling costs. The Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia 24.

From Now On We Specify

WALDRON

Users have learned that the design refinements of this new Waldron Coupling eliminate the chief causes of trouble and shutdowns. With no flexible hub connections to fatigue, no non-lubricated metal-to-metal contact between moving parts to cause wear, the Waldron Coupling easily proves the most economical coupling to buy and use.

Its advanced design also provides for a larger maximum bore that takes the same size shafts that heretofore required larger diameter couplings. This permits use of larger equipment, less shaft extension — a neater, more compact installation.

Waldron "Series A" Couplings are available in all popular types. Write for our Catalog 57 which gives full details, ratings, service factors, etc.

COUPLING DIVISION

JOHN **WALDRON** CORP.
Main Office and Works
New Brunswick, New Jersey
COUPLINGS

Housing for the exhaust fan which serves as a mammoth lung to provide fresh air to this West Virginian coal mine.

THE "BLOWHARD" THAT SAFEGUARDS MINERS' LIVES

Another top performance by a BWH product

In the busy 1943 days of peak war production, a big West Virginia coal mine needed a transmission belt for its giant exhaust fan.

Because this fan supplies fresh air to workers far underground, high speed operation with no shutdowns was vitally important. Tragic disaster may stalk tunnels where heavy, gas-laden air accumulates, and workers get out of a mine as fast as possible if the ventilating system breaks down.

To handle this responsible job, BWH engineers specified a 36-inch, 9-ply Bull Dog Cord Belt with quality-controlled friction. The rugged silver-hard duck cover adequately protects the low-stretch cord carcass of the belt. As a result, resiliency and recovery factors are assured under peak loads . . . trouble-free operation is maintained at maximum efficiency.

Working at a speed of more than a mile a minute, this rugged belt has chalked up an outstanding performance record . . . and it's still driving this huge safety fan, after four years of hard service.

Made by the exclusive ROTOCURE process of continuous vulcanization, BWH Belts have no "weak links" caused by press overlaps. And that means they assure steady operation, long life and low maintenance costs on the toughest jobs.

All BWH Industrial Rubber Goods are engineered for just one purpose . . . that is, to do a specific job extra well. Leading industries know they can always look to BWH for dependable ruggedness — to BWH distributors for dependable service.

HAVE YOU A JOB WHERE STAMINA COUNTS?

Bring us your toughest problems — we're specialists in solving them. Consult your nearest BWH distributor, or write directly to BWH.

Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all principal cities

PLANT: CAMBRIDGE, MASS., U.S.A. • P.O. BOX 1071, BOSTON 3, MASS.

The Story of Mr. Fordom's Boredom!

by Mr. Friendly

Mr. Fordom was very proud of his boredom.

He said, "No one can beat me for boredom!... "I'm the world's champion yawner-at."

And when Mr. Friendly, the American Mutual man mentioned group insurance and workmen's compensation, Fordom said... "It certainly is boring, isn't it!"

"Definitely!" said Mr. Friendly, "What could be duller than a business in which *accidents* seldom occur!...

"American Mutual's I.E. Loss Control*," he continued, "has helped cut exciting accidents as much as 80% in some businesses . . . and it's helped speed up production as much as 300% . . .

"It's a service that's included at no extra charge with every industrial policy . . . and these policies give you the chance to save 20% on premiums. But why get excited about that? It's only money!"

Well, Fordom bought an American Mutual policy and life was *delightfully dull* . . . accidents dropped, production rose, worker relations were smooth as silk.

Mr. Fordom says, he's never been so bored in all his life! He likes it that way. Wouldn't you?

Your helping hand when trouble comes!

AMERICAN MUTUAL

. . . the first American liability insurance company

FOR SMOOTH SAILING! There's no service in insurance quite like I.E. Loss Control*. Ask your American Mutual man to show you the "40 Convincing Cases" today, and learn what it can do for you. And write for "The All-American Plan for Business." American Mutual Liability Insurance Company, Dept. F-15, 142 Berkeley St., Boston 16, Mass. Branch offices in principal cities. Consult classified telephone directory.

**Accident prevention based on principles of industrial engineering.*

© 1947. AMERICAN MUTUAL LIABILITY INSURANCE COMPANY

New — A big-capacity, heavy-duty production unit engineered for safety . . . accuracy . . . convenience

Delta* 20" Wood-cutting Band Saw

Takes any type of blade in any size up to 1 inch in width. Maximum height under upper guide is 13½"

Now you can enjoy famous Delta quality in a heavy-duty wood-cutting band saw designed to meet the needs of your pattern shop, maintenance shop, shipping department, and other departments where you perform wood-sawing operations.

Delta 20" Band Saw features are among the newest and most advanced in the industry — many of them exclusive with Delta:

- Single-unit welded steel cabinet completely encloses all working parts. Doors provide quick access to wheels and motor.
- Adjustable "three-point mountings" between working parts and welded steel frame help to maintain exact alignment.
- Statically-balanced aluminum wheels are mounted in sealed-for-life ball bearings. Handy adjustable control on upper wheel helps you to maintain proper blade tension for each particular job.
- Wheels are made of aluminum, to reduce flywheel action after motor is shut off.
- Convenient foot brake is provided on lower wheel.
- Motor is mounted in base on pivot bracket which automatically provides correct belt tension.
- Dust chute carries away dust and chips . . . can be attached to dust collector.

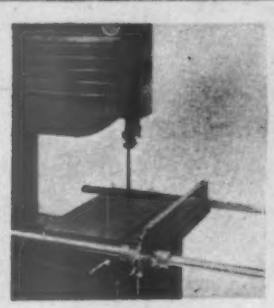
These are just a few of the reasons why you can expect creditable performance from the new Delta 20" Wood-cutting Band Saw.

Your nearby Delta distributor can give you the complete story on this new, husky machine. See him soon. Look for his name under "Tools" in the classified section of your telephone directory.

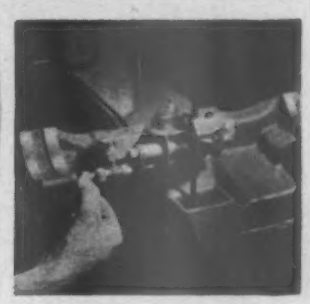
DELTA MANUFACTURING DIVISION
ROCKWELL MANUFACTURING COMPANY
MILWAUKEE 1, WISCONSIN
General Sales Office • 6 NORTH MICHIGAN AVENUE, CHICAGO 2, ILLINOIS

*Trade Mark Reg. U. S. Pat. Off.

20" x 24" table is rigidly supported on two widely-spaced trunnions. Conveniently tilts 45° to right; 12° to left.



Heavily-ribbed table is slotted to accommodate miter gage. It is also adaptable to use of a rip fence, as shown.



Ball-bearing blade guides, above and below table, are fitted with micrometer adjustment.

• Free Bulletin. Gives specifications and detailed description of Delta 20" Wood-cutting Band Saw. There's a copy ready for mailing to you. Request it by coupon below.

TEAR OUT COUPON AND MAIL TODAY!

DELTA MANUFACTURING DIVISION
618N E. Vienna Ave., Milwaukee 1, Wis.

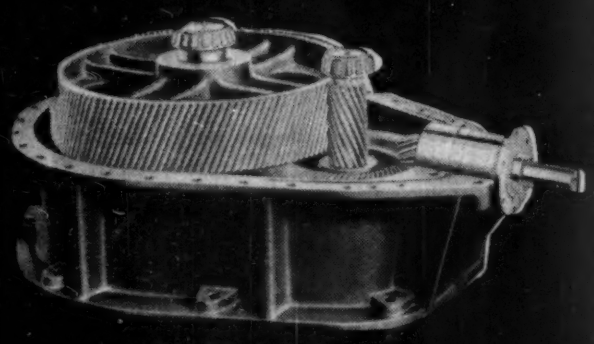
Send me free copy of Bulletin A-28-3 describing Delta 20" Wood-cutting Band Saw.

Name.....
Position.....
Company.....
Address.....
City.....(....) State.....

FALK Speed Reducers

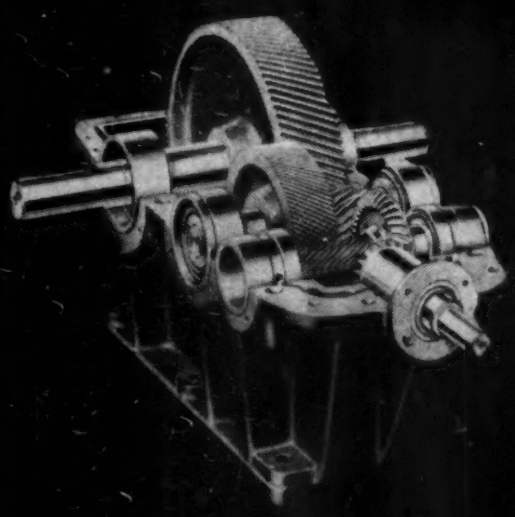
RIGHT (main illustration)

Parallel shaft, herringbone Falk Speed Reducer. Ratios: single reduction, 2.2:1 to 10:1; double reduction, 11.5:1 to 70.2:1; triple reduction, 80:1 to 300:1.



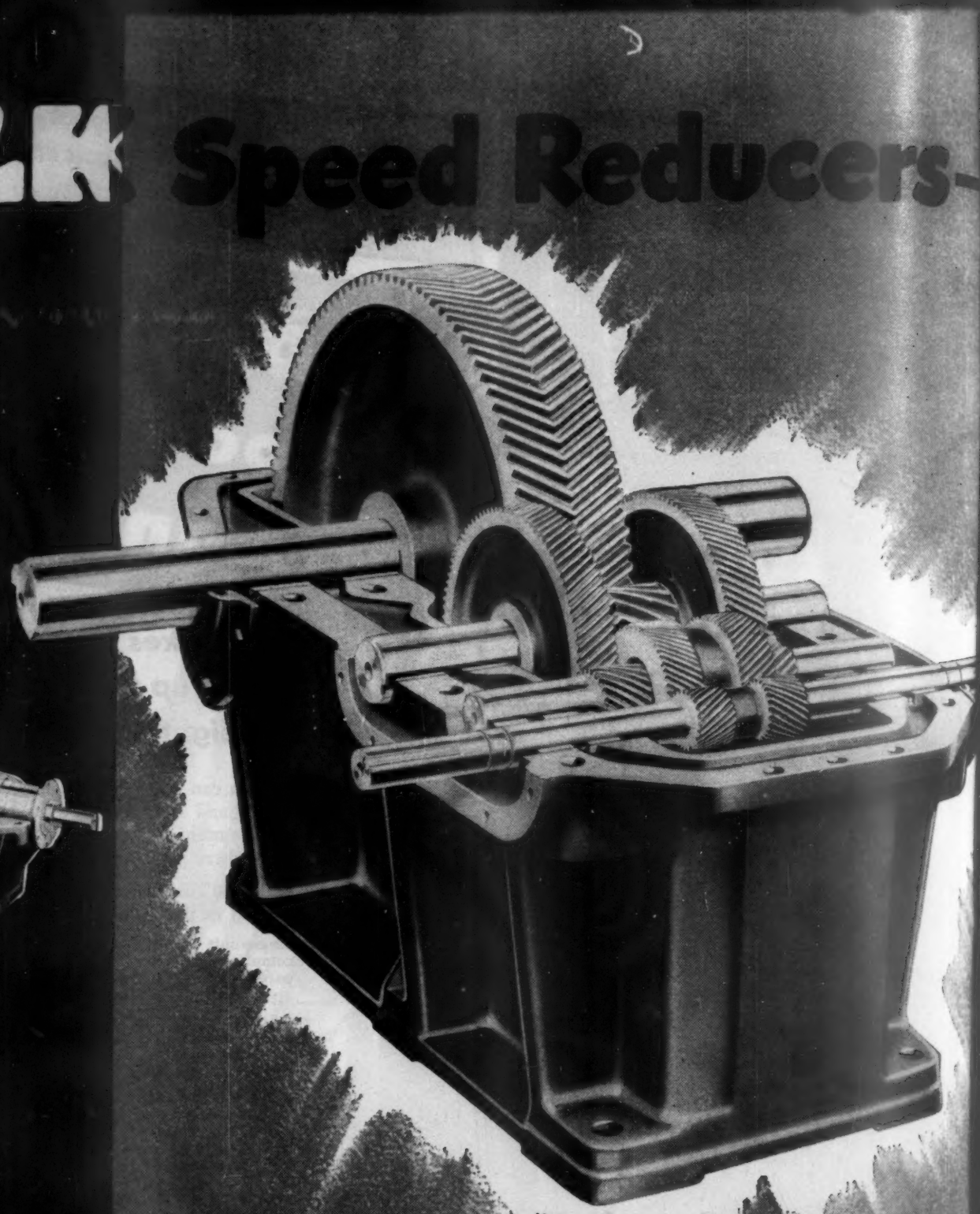
ABOVE

Right angle Falk Speed Reducer with vertical low speed shaft. Available in single reduction units, 1.5:1 to 5.28:1; double reduction, 5.7:1 to 43.5:1; triple reduction, 52.1:1 to 430:1.



ABOVE

Right angle Falk Speed Reducer., Available in single reduction units, 1.50:1 to 5.28:1; double reduction, 5.7:1 to 52.1:1; triple reduction, 56:1 to 515:1.



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strength . . . in Falk Speed Reducers is assured by the Falk "know-how" in determining materials, and by special production techniques developed by Falk alone.

rigidity . . . is built into every Falk Speed Reducer. Extra rigidity gives better performance and longer life.

compactness . . . of Falk Speed Reducers is the result of long experience in designing units that provide high efficiency, yet occupy a minimum of space.

simplicity . . . of design, has been achieved by Falk engineers in the development of the complete line of Falk Speed Reducers.

You get them all in every Falk Speed Reducer

THE FALK CORPORATION, Milwaukee 8 Wisconsin

Precision manufacturers of Speed Reducers . . . Flexible Couplings . . . Motoreducers . . . Herringbone and Single Helical Gears . . . Heavy Gear Drives . . . Marine Turbine and Diesel Gear Drives and Clutches . . . Steel Castings . . . Contract Welding and Machine Work. District Offices, Representatives, or Distributors in principal cities.

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WHATEVER your speed reducer problems or requirements, it is good business judgment to consult Falk first.

Today's line of Falk Speed Reducers is the culmination of more than a half-century of experience in metallurgy, gear design and the production of the highest quality power transmission equipment.

Falk Speed Reducers are available in many styles, types, ratios and capacities . . . they are the choice throughout industry because of their suitability to a wide range of requirements. There are many models . . . built in parallel, vertical and horizontal right angle types, with single, double and triple reduction ratios.

Efficiencies of 96% to 98½% at full load are attained through special Falk techniques of design and construction. Balanced performance is assured . . . longer gear life . . . smooth-running operation. Every Falk gear, herringbone or single helical type, is precision made . . . the patented lubrication system provides increased efficiency. Parts are interchangeable.

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Period Surveyed: October 1 to November 1

TREND INDICATORS

Wage Hours

GOOD FAITH NO DEFENSE FOR VIOLATION OF PORTAL-TO-PORTAL ACT

Section 9 of the Portal-to-Portal Act which relieves an employer from certain liabilities by virtue of good-faith reliance on past administrative rulings does not apply to an employer who, in operating an ordnance plant, relied on the constant checking of operations by the Ordnance Department of the Army, which knew and raised no objection to the classification of a certain employee as an executive exempt from the Fair Labor Standards Act. In this case, the general organization of employees was left to the employer and only regulated by the Ordnance Department in cases of violations affecting production of goods for the Army.

The employer argued that the officers knew of and raised no objection to the exempt classification of the plaintiff, and that if the plaintiff was not an executive under the F.L.S.A., they are excused from compliance with the Act by reason of its good faith in relying upon the administrative approval of the acts or omissions complained of, and his classification as an executive. Although the Ordnance Department may have approved the classification as exempt, there is nothing to indicate that they knew the facts with reference to his work, or that his suggestions or recommendations as to hiring and firing were not given any particular weight by the company during the period here under examination.

The company can not plead Section 11 of the Portal-to-Portal Act, which relieves an employer from payment of liquidated damages, unless it can prove both of the following actions of good faith: "That the act or omission giving rise to such action was in good faith," and "That the employer had reasonable grounds for believing that his act or omission was not a violation of the F.L.S.A." (Reid v. Day and Zimmerman, Inc., USDC S. Iowa)

UNION CONTRACT NO DEFENSE WHERE STATUORY OVERTIME PROVISIONS ARE VIOLATED

Union contract, entered into between the company and the Amalgamated Clothing Workers of America, specifically provided for hours of employment, and prescribed that such hours of employment should not in the case of any worker exceed 1000 hours during any period of 26 consecutive weeks. Records of the hours worked have been kept by the employer and these records show that many of these employees have in fact worked more than 1000 hours in periods of 26 consecutive weeks, and have during those periods on numerous occasions worked in excess of 40 hours in a workweek without receiving any overtime compensation.

The union contract is no defense to an action pursuant to the Fair Labor Standards Act, since it is apparent that they were not employed pursuant to the terms of the contract so as to fall within the exemption provided by Section 7(b)(1) of the Act. The introduction of the contract as evidence may not be used as a claim of exemption from remedial legislation. (Walling v. Dunne, USDC Mass.)

EMPLOYEE ENTITLED TO MERIT INCREASE

An employee who has 18 years of satisfactory service, during which time she received no merit increase, is now entitled to a merit increase despite the employer's claim that her present salary is a reasonable one.

The union insisted that the company is morally obligated to give the employee a merit increase, and that whether or not the rate paid the employee is equal to or greater than that paid in the area should have no bearing on the issue. The union believed that the establishment of the Salary Increase Plan for the youngest in service should have some bearing upon the determination of whether or not the subject employee should be given an increase, since this disturbed the relative position of the employee with regards to salaries paid younger employees. As a basis for his award, the arbitrator mentioned that the compensation and the rate of progression of relatively new and inexperienced employees should be given consideration. (In re arbitration between Standard Oil Co. and Central States Petroleum Union)

BONUS PART OF REGULAR RATE OF PAY

Merit bonuses, production bonuses, and "ribbon bonuses" based on production are part of an employee's regular rate of pay and must be added to his hourly rate for the purpose of calculating overtime. The production bonuses were arrived at by paying the employees ½¢ for every ribbon produced in a given week. They received this bonus without regard to the number of hours worked by them. The ribbon bonus was determined by a formu-

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That is because *Finnell* makes machines for *every* type of floor care and in sizes designed to fit specific needs. From the complete *Finnell* line, it is possible for you to choose equipment that provides the greatest brush coverage consistent with the area and arrangement of your floors . . . whether the equipment is for wet scrubbing, dry scrubbing, dry cleaning, waxing, or polishing.

The *Finnell* Scrubber-Vacuum shown at right (one of several) speeds the cleaning of large-area floors. It is self-propelled and a complete cleaning unit *all in one.* Applies the cleanser, scrubs, rinses if required, and picks up. Has a cleaning capacity up to 8,750 sq. ft. per hour!

The Motor-Weighted *Finnell* shown below at left is equipped with a *Feather-Touch* Safety Switch that provides *complete* automatic switch control. Switch works with either hand from either side of handle. When handle is released, machine stops. Self-propelled . . . glides over floor with virtually effortless guidance. Four sizes: 11, 15, 18, and 21-inch brush diameter. Inset shows machine with *Finnell* Dispenser for hot waxing.

The *Finnell* Dry Scrubber shown below at right cleans grease-caked floors in *one-tenth* the man-hour time required when hand-spudding. Has self-sharpening brush feature. Adaptable to wet scrubbing, steel-wooling, waxing, polishing.

Finnell also makes a full line of *Cleansers, Sealers,* and *Waxes,* as well as *Steel-Wool Pads, Mop Truck* and other accessory equipment. For consultation, free floor survey, or literature, phone or write nearest *Finnell* branch or Finnell System, Inc., 2512 East Street, Elkhart, Indiana. Canadian Office: Ottawa, Ontario.

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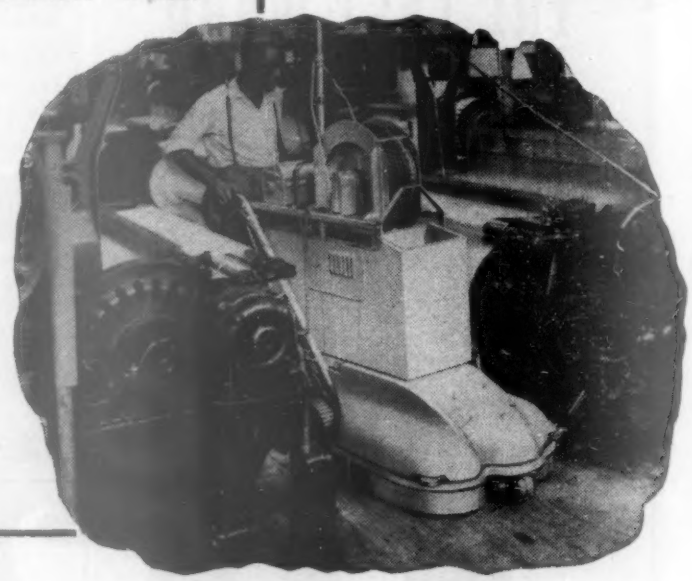
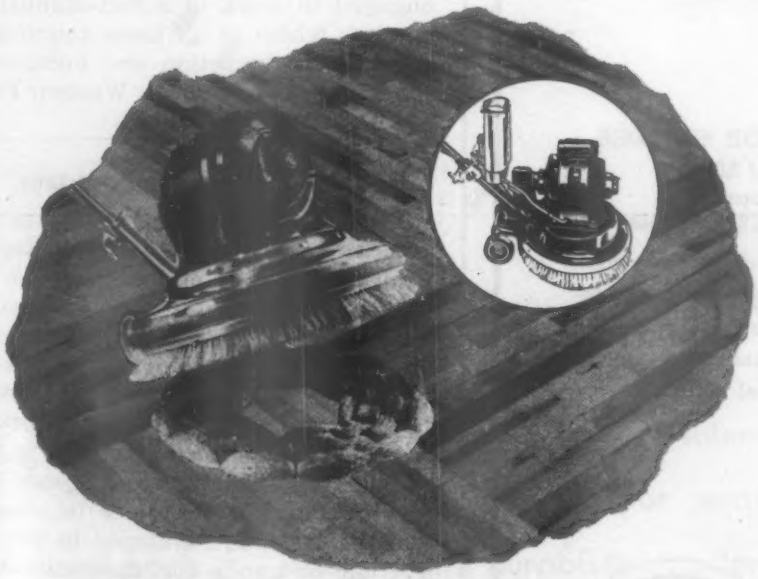


A *Finnell* Scrubber-Vacuum for Cleaning Large-Area Floors.



A Motor-Weighted *Finnell* for Dry Cleaning, Polishing, Waxing. Also Wet Scrubs, Sands, Grinds.

A *Finnell* Dry Scrubber for Cleaning Grease-Caked Floors.

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la and was fundamentally based on production. The merit bonus, totaling about 25 per cent of the profits, was paid weekly in varying amounts to the plaintiffs.

Whereas the company contended that the bonuses constituted mere gratuities or gifts which it was not bound contractually to pay, the Court pointed out that "although the employees knew they could not legally compel the company to make these payments, no one can doubt that the employees asumed that, in the normal course of events, the employees would receive them." The company arranged to pay the bonuses to different employees and, therefore, these bonuses constituted parts of the regular rate at which the respective plaintiffs were employed. (Roberts v. Sperry Co., USDC Mass.)

PERSONNEL MANAGER HELD EXEMPT

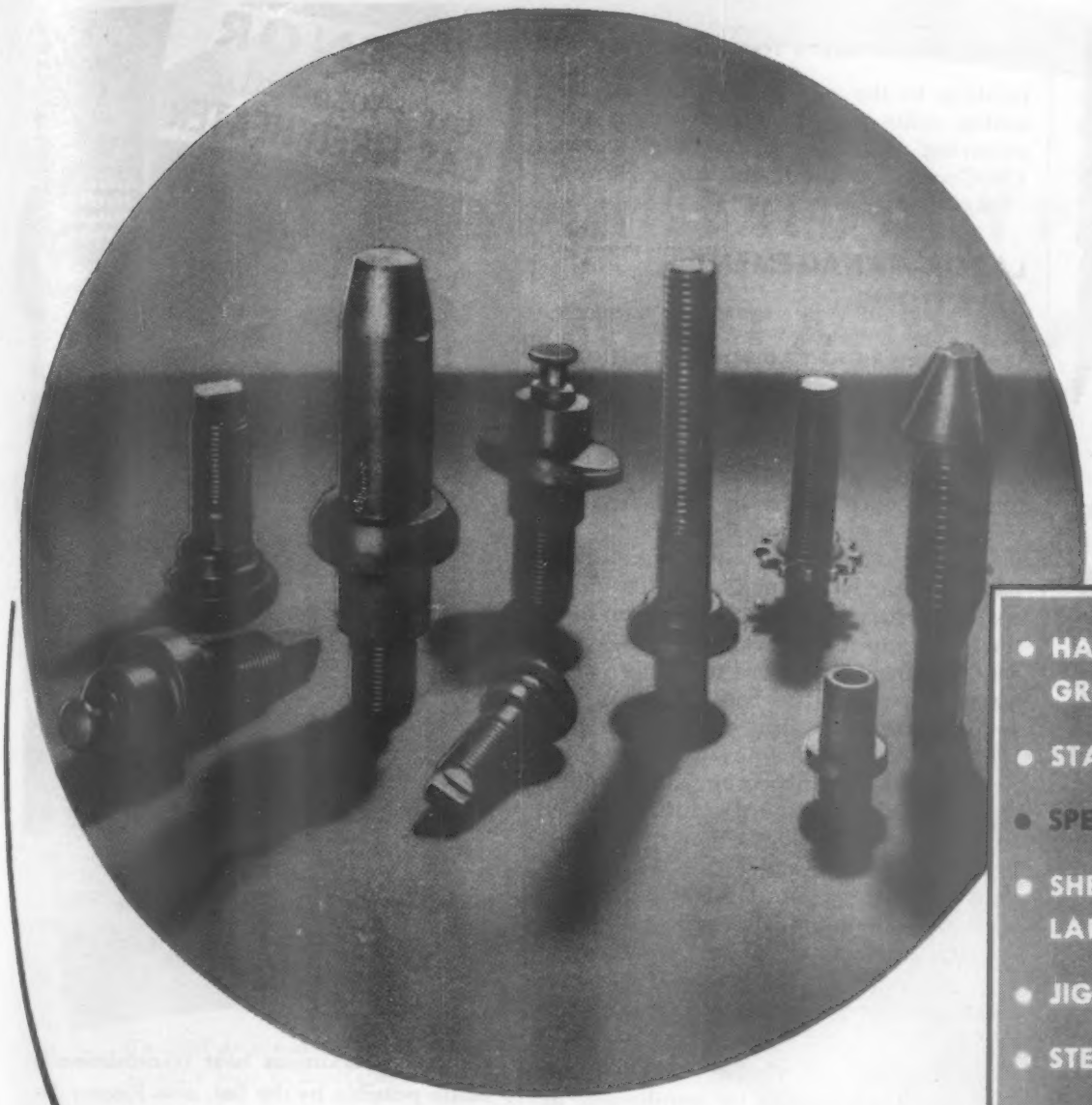
Employee engaged as a Personnel Manager, who managed a recognized department, customarily and regularly directed the work of other employees, had the authority to hire and fire employees, and was compensated on a salary basis at the rate of $240.00 per month, was actually considered an administrative employee.

The administrator has considered certain personnel directors to be within the administrative exemption, where they are directly concerned with management policy. Even though the employee could not *exparte* change or initiate personnel policies, he did take an active part in making recommendations as to personnel procedures. For an employee to be an exempt administrative employee, it is not necessary that he be constantly or continuously engaged in work of a non-manual nature, or which at all times requires the exercise of discretion and independent judgment. (Vechiola v. Western Foundry Co.; USDC N. Illinois)

ENGAGED IN INTERSTATE COMMERCE

Employees who are engaged in procuring goods from other states for transportation to and delivery at employer's warehouses are engaged in "commerce" within the meaning of the act. Likewise, employees engaged in unloading and checking goods shipped in interstate commerce, and in handling them on the platforms, as well as those engaged in shipping such goods from a warehouse in one state to stores in another state, are engaged in the production of goods for commerce or in an occupation necessary to such production.

Therefore, office and warehouse workers, employed by a company which operates a chain of local and out-of-state retail stores, are engaged in interstate commerce. In the instant case, the interstate activity of the employees involved is a regular recurring part of their work. It is not casual or sporadic. The employees spent approximately fifteen per cent of their time in work relating to the out-of-state stores, de-



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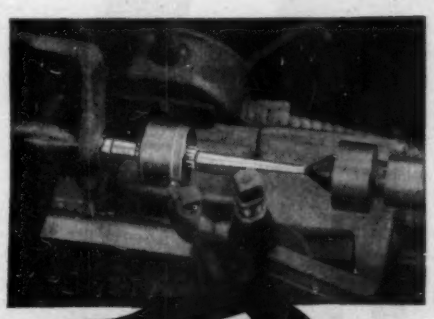
Ideal for Tool Room too. Only 5 mandrel sizes to handle *all* work with 3/8" to 2½" hole. Eliminates special mandrels — saves hours of machine time.



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relating to the out-of-state stores, devoting some time to the ordering and receiving of the out-of-state goods. (McComb v. Blue Star Auto Stores; CCA-7)

LABOR-MANAGEMENT RELATIONS

*EMPLOYER'S RIGHT TO DISCHARGE WITHOUT PRIOR WARNING

Where the contract specifically gives management the right to discharge for habitual unsatisfactory production, an employer may properly discharge an employee without prior warning for this offense. The fact that the employer has voluntarily warned some employees of dissatisfaction with their production prior to their discharge does not require the employer to issue such warnings where the contract does not set forth such a requirement. The fact that general inefficiency seems to be present in the inspection department does not alter the individual responsibility of the employee. (In re arbitration between Pierce Governor Company, Inc. and International Union, United Automobile, Aircraft and Agricultural Implement Workers of America)

*MANAGEMENT'S RIGHT TO CONTRACT WORK OUT

Under contract clause which reads "All work performed by employees, as defined herein, shall be done by members of the union," management is not deprived of its right to contract work out. The above clause simply means that whenever employees perform work covered by the agreement that is production or maintenance work, the employee shall belong to the union. Moreover, the agreement made special provisions for contract work, and provided that in areas where the union has bargaining jurisdiction the workers on the contract job shall be members of a *bona fide* union.

The evidence failed to establish that by reason of the company contracting this painting job it deprived the regular painters of work. Their transfer to another class of work was a matter of expediency rather than primarily for lack of work in their classification of painting. In addition, the company offered to pay the painter's rate to these employees when transferred to lower rated work. (In re arbitration between Ashland Oil & Refining Co. and Oil Workers International Union)

*EMPLOYER'S RIGHT TO REJECT AN APPLICANT BECAUSE OF AGE

Collective bargaining agreement provided "Throughout the terms of this agreement, the employer agrees to hire only members of the union in good standing. Men laid off through no fault of their own, shall, in the order of their

*In this classification, items marked with an asterisk are also considered to be trend indicators.

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Maximum heat transmission is made possible by the flat, oval Reznor designed heat exchanger tubes that yield more heat to the soft rush of air from the fan. The Heaters are efficient, economical and AUTOMATIC.

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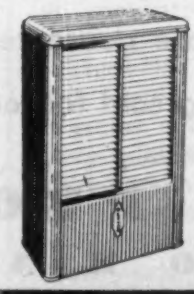

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Gas-fired dryer removes moisture from plate with 130° air-blast prior to laminating.

Plastic layer between two pieces of plate glass receives initial heat treatment during one-minute cycle through 180° Gas-fired oven.

LAMINATION of glass and plastic for windshields and side panels is a streamlined process at the Auto Glass Manufacturing Company, Detroit, Michigan. And, in the production-line, process heating is accomplished with modern GAS ovens, drying chambers, and steam generators.

This simple Gas Equipment fulfills every heating requirement for laminating glass and plastic layers. Automatic controls facilitate production scheduling and assure uniform results. Equipment maintenance is virtually eliminated because the productive flames of GAS do not require highly complex apparatus.

Wherever you need heat for processing you can install simple Gas Equipment right in the production-line. Your local Gas Company representative will assist you in selecting equipment for your specific needs.

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Final sealing of plastic to glass, and optical clarifying of the plastic, are accomplished in 50-minute cycle with steam from Gas-fired 40 hp boiler (center) to autoclaves (r & l) operated at 300° and 125 psi.

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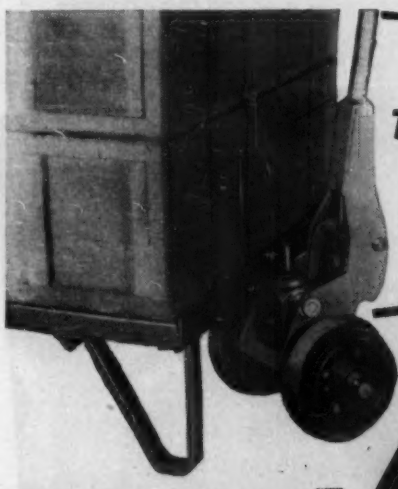

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FIG. 421. Standard Industrial Skid, 9 platform sizes from 24" x 48" to 42" x 72". Capacity 1800 lbs. Metal or Rubber Tired Wheels.

FIG. 420. Heavy Duty Industrial Skid, 9 platform sizes as above. Welded angle steel frame. Capacity 2800 lbs. Metal or Rubber Tired Wheels.

Only the Nutting Jack is operated by gravity and leverage —no springs to break!—no danger of your jack-skid system suddenly bogging down. The Nutting Jack is unique in its simple, rugged construction, and has many other advantages: complete control of load at all times, easy swiveling under full load, extreme range of tongue positions for short turns, extra high lift for steep ramps or high thresholds without striking skid legs.

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company seniority of their respective crafts, for a period of 2 years from the date of layoff, be sent by the local or unit having jurisdiction to fill vacancies as they occur. If none are available, the local or unit having jurisdiction shall send the other men to fill the vacancies. Any such other men shall be competent and meet the employment requirements of the employer."

The employer is therefore entitled to reject a union's applicant on account of his age. Since the clause states that prospective employees shall "meet the employment requirements of the employer," it grants to the company the absolute right to fix its own standards of employment. The company pointed out that the age at which persons are hired has a profound effect not only on the efficiency of its operations but upon their proneness to accident and compensable disability, upon absenteeism due to illness, labor turnovers, and upon public relations, and that it is, therefore, justified in adopting an age requirement for new employees. (In re arbitration between Borden's Farm Products and International Brotherhood of Teamster, Chauffeurs, Warehousemen & Helpers of America)

***EMPLOYER NOT REQUIRED TO BARGAIN WITH ORGANIZATION REPRESENTING ITS GUARDS**

Under the Labor-Management Relations Act, an employer is not required to bargain with a labor organization as representative of its guards if that labor organization admits to membership, or is affiliated with an organization admitting to membership employees other than guards.

Therefore, an order of the National Labor Relations Board, requiring the company to bargain with the International Association of Machinists as representative of the employer's guards, can not be enforced since the union admits to membership employees other than guards. The Board's order is contrary to the policy of the Act, notwithstanding its enactment subsequent to mandate of Supreme Court that the order be enforced. (NLRB v. Atkins & Co., CCA-7)

***EMPLOYEE HAS THE RIGHT TO HAVE HIS CASE HEARD BY AN ARBITRATOR**

Under contract clause which provides that "any worker who is discharged shall have the right to have his or her discharge heard by an arbitrator as hereinafter provided," an employee who was discharged for stealing meat has the right to have his case heard by an arbitrator, despite the employer's claim that the issue was closed by agreement of the president of the local union to the discharge. The fact remains that the employee himself never acquiesced in any way to the discharge.

While meat stealing is a serious problem in meat plants and should be disciplined, employee who was caught taking 1¼ pounds of meat processed in employer's plant should not be discharged in view of his 10½ year record

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ut the steadfast confidence of father and son in the success of their amazing venture is ndicated daily by the modern traffic this world-famous bridge continues to carry now . . . years later.

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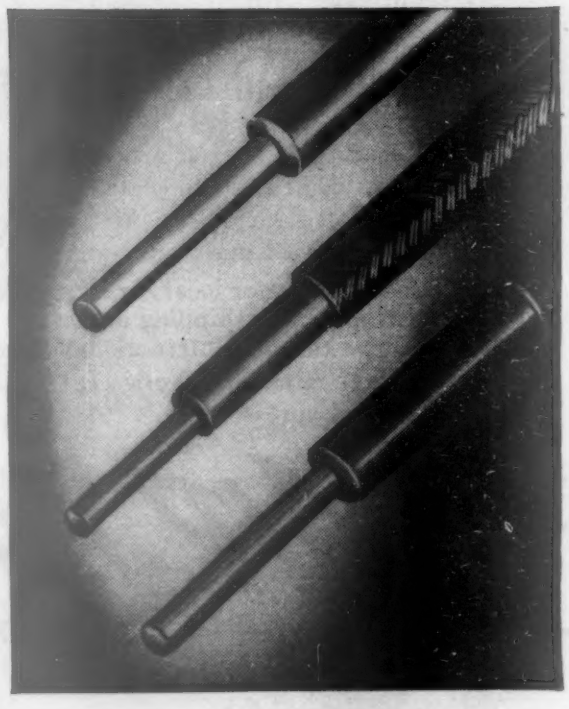

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When you need building wire for circuits p to 600 volts in homes, offices or plants, choose Roebling 60 type R for operating temperatures up to 60°C (140°F.), or Roebling type RH for use up to maximum temperatures of 75°C (167°F.) Both meet 1947 code demands and Underwriters' Laboratory Standards.

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RAILWAY EXPRESS AGENCY
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Fastest delivery — at low rates

Memphis, Tenn. manufacturer requested fast delivery of spare parts (34 lbs.) located in San Angelo, Tex. Picked up 11:50 AM the 21st, delivered same day at 5:40 PM. 668 miles, Air Express charge $7.31. Other weights, any distance, similarly inexpensive and *fast*.

THE SCHEDULED AIRLINES OF THE UNITED STATES

of otherwise satisfactory service. The arbitrator pointed out that although the parties are in agreement that theft of meat is a serious problem and it is the union's policy not to protest discharges for that reason, under the special circumstances of this case, the company would be doing a reasonable act in reemploying the employee with the understanding that no further incidents will be tolerated. (In re arbitration between Boston Sausage & Provision Company and United Packinghouse Workers of America)

*EMPLOYEES WHO HAVE BEEN ON LAYOFF ARE ELIGIBLE FOR VACATION

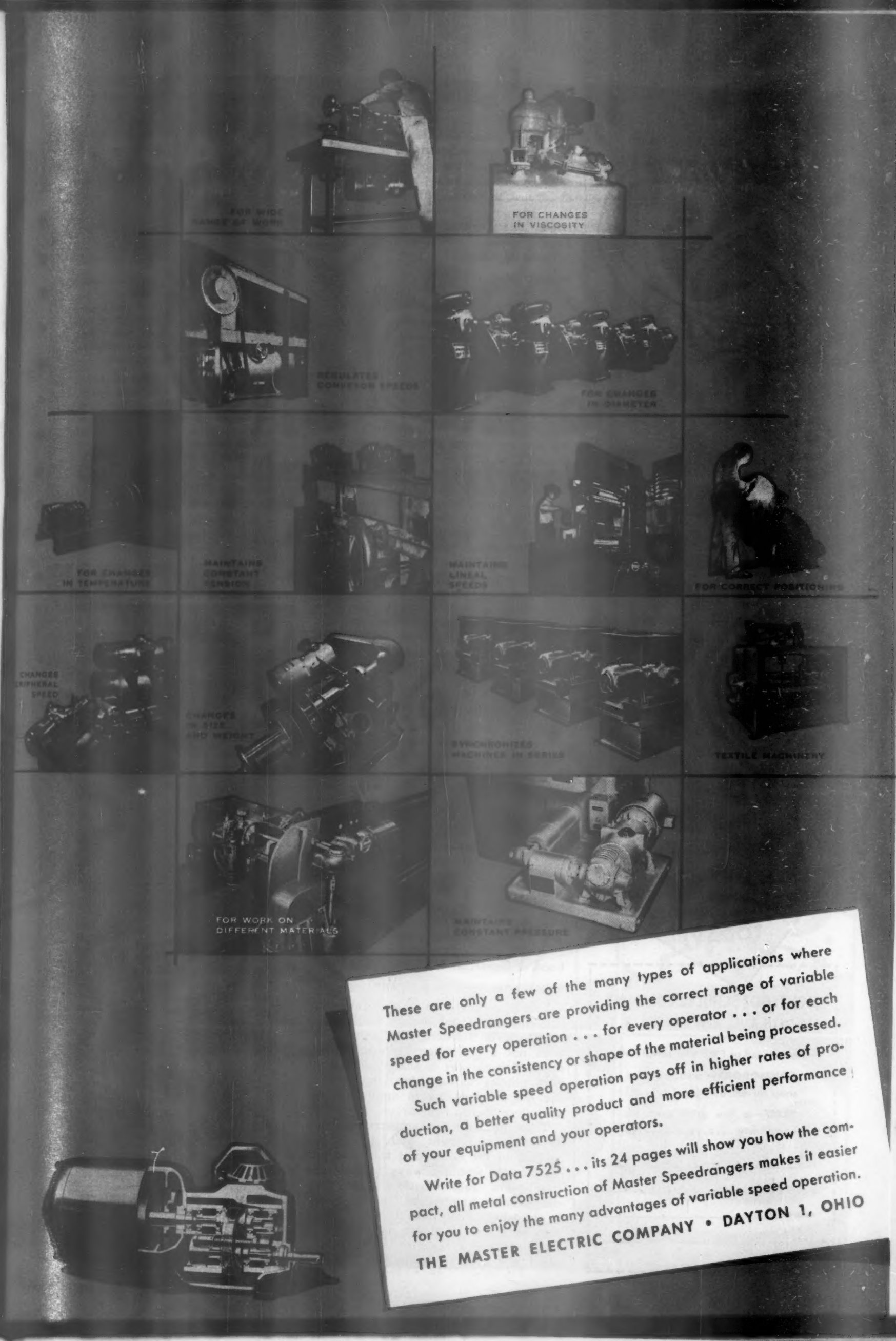
Under contract clause which provides that seniority shall be lost in cases of quit, discharge for cause, or 12 consecutive months of unemployment, workers who have been on layoff for less than 12 months are employees for purpose of determining eligibility for holiday and vacation pay. Employees may not be disqualified from vacation merely because they are on layoff on vacation eligibility date. To make the granting or denying of a paid vacation depend on whether an employee is at work on a particular day would be to go completely counter to the basic conception on which vacations are based. Therefore, the employees are eligible for vacation, but are entitled only to such amount of vacation as is proportionate to amount of time that they have actually worked during the year. (In re arbitration between Ardee Plastics Company, Inc., and United Gas, Coke, & Chemical Workers of America)

*EMPLOYEES ENTITLED TO VACATION THOUGH NOT ON PAYROLL

Where the vacation clause of the contract stated that "each worker employed by the employer for a period of at least one year prior to June 1st of any year shall be entitled to one week's vacation with pay . . . each worker employed by the employer for a period of over six months prior to June 1st of each year shall be entitled to a pro rate vacation," the employer is required to pay pro rated accrued vacations to employees on its payroll on April 4, 1947, and who had been terminated on that date because of a strike.

The arbitrator found that the language of the contract clause providing for certain vacation rights and setting forth a period of eligibility simply required the employee's work performance during a period of six months or more during the year prior to June 1st of the year in which vacation rights were accrued, and did not in fact require actual employment on the vacation anniversary date of June 1st. Where vacations are a matter of collective bargaining covered by the contract, they are considered as an earned right and not as a privilege over which the company exercises exclusive control.

Where a contract does not contain any express provision to the contrary,



These are only a few of the many types of applications where Master Speedrangers are providing the correct range of variable speed for every operation . . . for every operator . . . or for each change in the consistency or shape of the material being processed.

Such variable speed operation pays off in higher rates of production, a better quality product and more efficient performance of your equipment and your operators.

Write for Data 7525 . . . its 24 pages will show you how the compact, all metal construction of Master Speedrangers makes it easier for you to enjoy the many advantages of variable speed operation.

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. . . barely visible to the eye, soap and scrubber are welded together to form a single, integrated, indivisible unit . . . a complete cleanser in itself!

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F-12

LABOR DEVELOPMENTS *(continued)*

vacations accrue to the benefit of the employee irrespective as to whether his employment relation has terminated or not, provided the specific stipulated condition of eligibility, such as length of service, minimum time worked, etc., have been met. (In re arbitration between The Brynmore Press, Inc., and Paper, Novelty, and Toy Workers International Union)

***PARENT FEDERATIONS NOT REQUIRED TO FILE NON-COMMUNIST AFFIDAVITS**

Section 9(b) of the Labor-Management Relations Act, which requires as a condition precedent to processing of a case before the Board that non-communist affidavits be filed by each officer of a petitioning labor organization "and the officers of any national or international labor organization of which it is an affiliate or constituent unit," does not require parent federations such as the AFL or CIO to file such affidavits. Where both the International and the Local have complied fully with the Act and the parent labor organization has not done so, the Board has power to continue its investigation. "In ordinary labor relations parlance, the words 'national or international labor organization' have a definite and almost technical meaning. They refer to labor organizations such as internationals. The national or international unions, although they are affiliated with either the AFL or CIO, still remain autonomous self-governing units of the labor movement."

The Board pointed out that every definition or description of the AFL and the CIO clearly indicates that they are different from national or international labor organizations. The AFL has been defined as "a federation of independent, autonomous international unions, each having its own traditions and its own internal government."

"In the absence of clear expression of legislative intent to the contrary, Congress, when legislating on a specialized subject, is deemed to have used words in the sense in which they are commonly understood by those who deal daily with that subject." (Northern Virginia Broadcasters, Inc., and Local Union No. 1215, International Brotherhood of Electrical Workers)

***ORAL AGREEMENT SIGNIFICANT**

Whereas unwritten side agreements are not significant where their very existence is disputed, this same rule does not apply when an oral agreement of some sort is acknowledged by both parties to have been made, and the dispute pertains to application of the agreement to new circumstances.

Thus, where the company made a special arrangement with the union in 1941 to the effect that the 12 oldest hamboners would always receive the hamboners' rate whatever else they did besides hamboning, the company is obligated to continue the hamboners' rate with the 12 oldest hamboners as long as they remain in work at the plant and as long as the job of ham-

Another DOLGE First!

KADOL

The New LIQUID Floor Cleaning Compound

DEVELOPED IN DOLGE LABORATORIES

KADOL is *today's method* of cleaning various types of flooring because its concentrated, brilliant *liquid* form permits *pouring* to make an economical dilution of *only two ounces to the gallon of water.* Easy to handle—and it goes a long, *clean* way in keeping your floors immaculate.

KADOL is *neutral* — can be used safely on linoleum, cork; also wood mastic, tile and many other surfaces, and is recommended as a *general cleaner.* No rinsing is ordinarily required; when a KADOL-cleaned surface is dry-mopped, an attractive polish results.

KADOL has no druggy, clinging odor associated with usual cleaning compounds. Its fragrance is pleasant and unobtrusive.

Write for the new KADOL booklet which explains its many advantages, and see your DOLGE Service Man.

KADOL

The C. B. DOLGE CO.

WESTPORT, CONNECTICUT

Rotary Joe says:

"THERE'S AN EASIER WAY TO DRILL CONCRETE"

IF you have holes to drill in concrete, do it the easy way. Use Rotary Concrete Drill Bits. They cost more, but they are faster, quieter, cheaper in the long run. You'll get precision holes, not deflected by hard rock. Rotary Concrete Drill Bits last longer because they are hand machined out of the finest material. Fluted to carry away chips. Three or more cutters. Resharpened free at any time. Unconditionally guaranteed. Special designs and sizes on order.

WRITE FOR FOLDER

A Few Dealerships Still Open

Rotary Concrete Drill Co.

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A BUYING GUIDE FOR ABRASIVES

POINT No. 11

District Representation

Certain buyers of abrasives find the measure of their sources of supply in the local representatives of abrasive manufacturers. Therefore, it is a matter of great satisfaction to us to have men of ingenuity and experience representing us in key locations throughout the country. It is by means of our district organization that users are given direct access to the engineering, research, and wide scale technical activities of The Carborundum Company. It is their intelligent handling of abrasive problems, and their sincerity in serving customers' needs that makes every user think first of CARBORUNDUM, when they think of abrasives. The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM

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COATED ABRASIVES

ABRASIVE GRAINS AND FINISHING COMPOUNDS

Specialized wheels by CARBORUNDUM for thread grinding

Diamond wheels to meet stiffer technical needs

"Carborundum" is a registered trade-mark which indicates manufacture by The Carborundum Company

Cool-cutting green grit wheels for cemented carbide

A coated abrasive for every sanding and finishing condition

All standard shapes are supplied in grinding wheels by CARBORUNDUM

LET would-be burglars have their happy dream. For if your plant has Cyclone Fence protection, dreaming is as far as they'll get. And if it hasn't, now's a good time to consider your fencing requirements.

Why not start by sending for our free book? It explains the special features of design, construction and installation which enable Cyclone Chain Link Fence to stay taut and true despite gruelling conditions of climate, weather and terrain.

Or call on one of Cyclone's engineers—without obligation—to assist you in planning the right fencing for your particular job. There are 14 types of U·S·S Cyclone Fence available to meet every need.

No job is too large or too small for Cyclone. Act now—and look forward to years of trouble-free protection for your plant.

CYCLONE FENCE DIVISION
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We'll send you our free, 32-page book on fence. It's full of facts, specifications, illustrations. Shows 14 types of fence. Before you choose any fence for your property, get the facts about Cyclone.

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Interested in fencing: ☐ Industrial; ☐ School; ☐ Playground; ☐ Residence. Approximately.....feet.

UNITED STATES STEEL

boning exists at that plant, no matter what jobs they perform and regardless of whether or not the gang has been reduced until such arrangement has been changed by collective bargaining between the parties. The arbitrator rested his opinion substantially on the fact that such special treatment had assumed by practice the proportions of a custom at the plant in question. (In re arbitration between Swift & Company and United Packinghouse Workers of America, CIO)

***VIOLATION OF SAFETY RULE ISSUED VERBALLY NO BASIS FOR DISCHARGE**

An employer may not discharge an employee for violating a safety rule by working too close to a gas tank in the garage, since the company failed to detail the safety measures and have them prominently posted throughout the garage, setting forth the precise procedures to be followed, and warning of immediate discharge in the event of non-compliance. The company merely issued verbal instructions about procedures for welding near gasoline tanks, and those were not rigidly enforced.

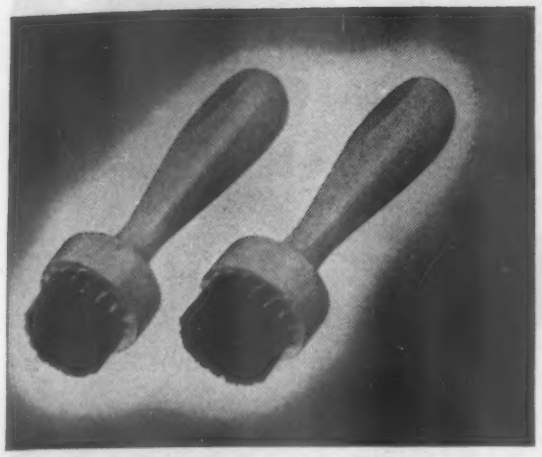
The arbitrator brought out the fact that the imminent danger of gasoline explosions, and the possible loss of life and substantial property damage resulting therefrom, must be viewed with great concern. The company cannot rely upon normal or ordinary safety rules. The efficient operation of its business and inherent managerial responsibility obligates and requires the company to apply special precautionary measures. The company's failure to exercise the proper degree of care to avoid risk or danger was reflected in the work of the employee. (In re arbitration between Armour & Company and United Packinghouse Workers of America)

***WAGES AND DISCHARGE NOT ARBITRABLE**

In the absence of a mutual stipulation between the parties, there can be no "wage adjustment" during the lifetime of an existing contract, and the question of whether a union is entitled to a wage adjustment may not be arbitrated under the arbitration provisions of the collective agreement.

Also, the question of whether an employee was unjustly discharged, for the reason that his work was of a substandard quality and quantity, may not be arbitrated, since the contract provides that the right to discharge for substandard quality or quantity of work shall be exercised by the employer "in its sole judgment and discretion, and notwithstanding anything herein contained, shall not be the subject of grievance provisions or arbitration." The court pointed out that where the specification for the discharge is the substandard quality or quantity of the work of the employee, the employer is clothed with a wide discretion which is unreviewable. (Berglas Manufacturing Company v. Shadel, N. Y. Supt. Ct, Spec. Term, Part 1)

How Much Money Can NYLON-BRISTLED Brushes Save You?



1. Bolt-Hole Brushes bristled with Du Pont nylon are used to remove excess porcelain enamel from bolt-holes. They stand hard abrasion.

They're serving and saving in 30 major industries today!

Du Pont nylon bristles do a job no other type of bristle can do and often outlast other bristles — in some brushes up to 12 to 1. That means several times the *value*.

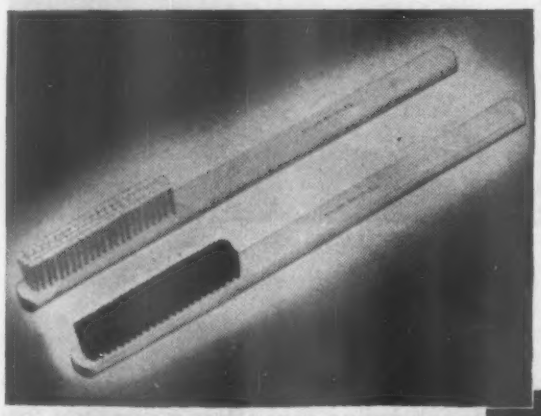
Nylon-bristled brushes *last* and *last* and *save money*, because they withstand constant abrasion, immersion, chemical solutions, and warm soapy water.

If you have a brush problem in your business, chances are nylon-bristled brushes may save you money. Write us today, describing what your brushes must do and the conditions under which they must operate. Du Pont Technical Service men will be glad to study your requirements and advise whether nylon can meet them. If it can, we'll help your regular brush supplier with details on designing and making the brushes for you. If you have no regular supplier, we can readily help you locate one.

How *much* can they save you? The amount will depend on how many and what kind of brushes you use, and how they must operate. If nylon can serve you, you may be *amazed* at the money it can save!

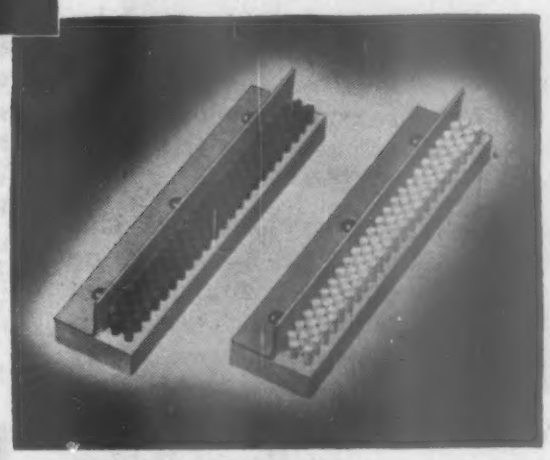
• • •

FREE BOOKLET tells the story! "Industrial Brushes Made of Du Pont NYLON" tells how others are using brushes bristled with Du Pont nylon for better service at lower cost. Send for it today! Write E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept., Room 7612, Arlington, N. J.

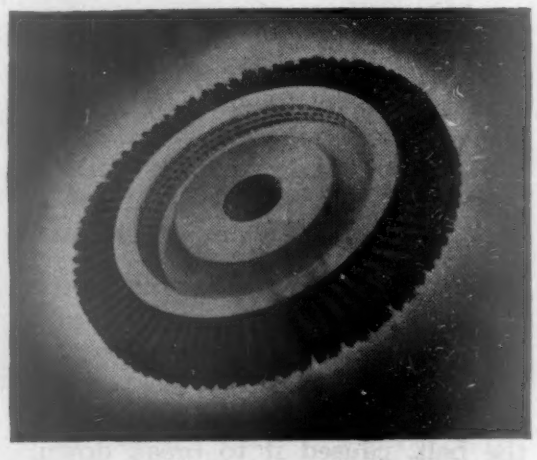


2. Jewelers' Cleaning Brushes bristled with nylon give long service, withstand hard wear and abrasives. Brushes can be made stiff, medium or soft.

3. Edging Brushes with Du Pont nylon bristles, used in the porcelain enamel industry, last far longer on the average than brushes with other bristles.



4. Polishing Brush for jewelry manufacturers, bristled with Du Pont nylon, does a thorough job, stays on the job longer.



BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

DU PONT

DU PONT NYLON BRISTLES

Takes a 10,000-ton load off your mind

Moving 10,000 tons of rock in a day would be a load on anybody's mind!

That's what the owner of a large stone plant discovered. To maintain production schedules, 2½ million pounds of crushed rock had to be moved out of the plant every hour.

Biggest difficulty was that the plant's conveying equipment couldn't stand up under the pace. Bearings burned out. Sharp, jagged rock slashed the conveyor belt. Moisture penetrated the belt, caused it to break down.

As a result, production at the plant had to be stopped until conveyor repairs were made and belting replaced.

The owner called in Robins Engineers. They solved the problem by developing a special Robins Conveyor capable of moving more than 1,000 tons of crushed rock an hour. It was designed *to take a 10,000-ton load off his mind!*

Like other Robins Conveyors, this efficient unit assures low operating and maintenance costs. And patented One-Shot lubrication makes it possible to grease idlers quickly and easily without reaching under the belting.

What's more, with your Robins Conveyor you can get Hewitt Belting. This famous belting has a strong, durable cover of shock-absorbing rubber which withstands extreme gouging, tearing and abrasion . . . which resists mildew and moisture.

Robins Conveyors are made by the only organization that offers a complete conveyor system . . . that takes entire responsibility for both conveyor and belting. No need to "piece together" a conveyor system from several different sources! Robins engineers the entire job for you.

Find out now how Robins can help you take a load off *your* mind. There is a Robins Conveyor to meet your need. Write Robins today!

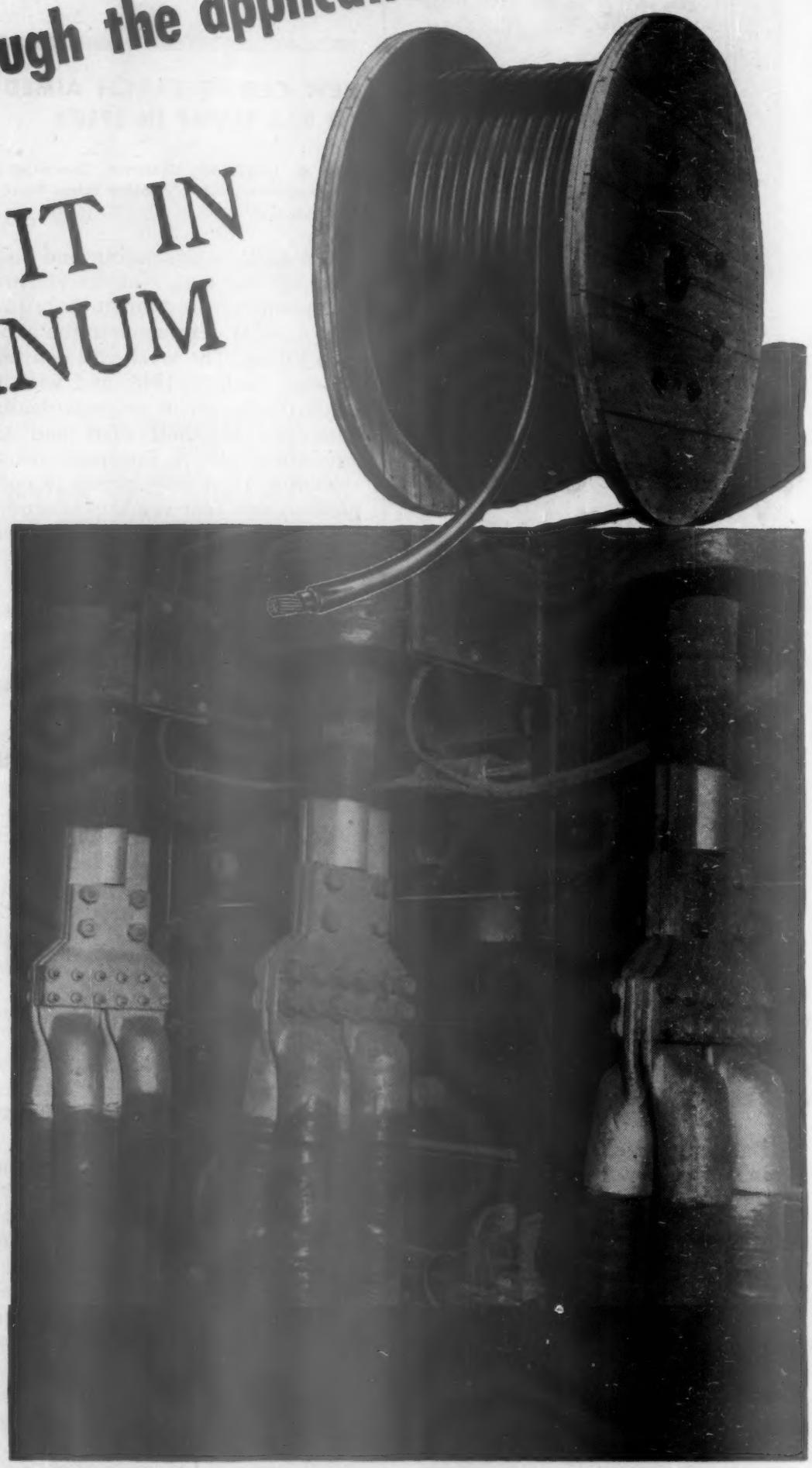
ROBINS CONVEYORS

ROBINS CONVEYORS DIVISION, Hewitt-Robins Incorporated, PASSAIC, NEW JERSEY

HEWITT-ROBINS INCORPORATED HR

No matter how tough the application . . .

FIGURE IT IN ALUMINUM



The tougher the wiring problem, the more reason to "figure it in aluminum". Alcoa E.C.* Aluminum gives you everything you want in a conductor, and reduces your over-all wiring costs.

Wire and cable manufacturers are calling aluminum "The conductor of the present and future". Because it presents

NO PROBLEMS of Conductivity

NO PROBLEMS of Joints and Terminals

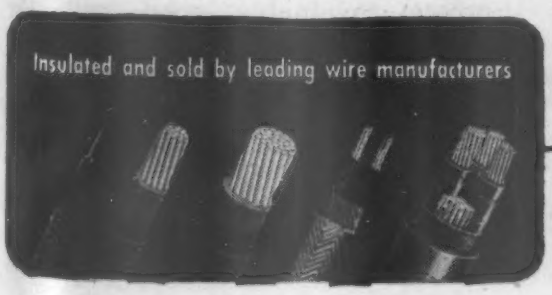
NO PROBLEMS of Conduit Layout

NO PROBLEMS of Availability

And aluminum's lightness makes wire and cable made of Alcoa E.C. Aluminum easier to handle. For instance, a 500 mcm. insulated aluminum cable is less than half the weight of an identical copper cable. Your men will like that. And your top management will like the savings in over-all job costs.

Insulated E.C. Aluminum is ready for your use today. Ask your wire and cable supplier about it, or write: ALUMINUM COMPANY OF AMERICA, 1900 Gulf Building, Pittsburgh 19, Pa.

* E.C.: Electrical Conductor Aluminum



ALCOA EC ALUMINUM

FOR ELECTRIC WIRE AND CABLE

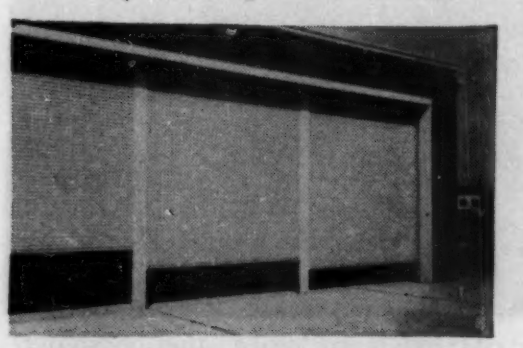
of Door Costs

Quick, easy, push-button control featured by Kinnear Motor Operated Rolling Doors gives you a tighter grip on *all* door costs. It helps cut heating and air-conditioning costs through prompt, rapid closing of doors. It saves time and steps (you can have any needed number of additional controls at remote points). It avoids traffic bottlenecks at doorways, and along with these operating advantages, you get the extra durability, protection and space-saving efficiency of these rugged, all-steel doors with their world-famous coiling upward action.

with MOTOR OPERATED

KINNEAR DOORS

Built any size, for installation in old or new buildings. Write today for complete information.



KINNEAR ROLLING DOORS

The KINNEAR MFG. COMPANY
FACTORIES
1540-60 Fields Ave. • Columbus 16, Ohio
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Offices and Agents in Principal Cities

THEY SAY AND DO

NEW CED RESEARCH AIMED TO BAR SLUMP IN 1950's

PAUL G. HOFFMAN, Chairman, Committee for Economic Development, speaking before Board of Directors, CED.

The CED is expanding and stepping up the tempo of its research and planning program to help prevent a major depression in the Nineteen Fifties. The work will continue at least through 1948, and will include a new set of projects dealing with the Marshall plan and the whole problem of European reconstruction. It is now hoped to complete in one year a group of studies that normally would take eighteen months to two years.

It seems to us that at no time in the history of our Republic has it been so important that prosperity in America be maintained.

A major setback not only would create terrific internal hazards in the form of crackpot legislation, but would also play directly into the hands of the Kremlin.

With sound policies with which to create an encouraging economic climate, enterprise in America can so flourish that not only can we give prosperity to our own people, but we will also help the rest of the world get back to a self-reliant and self-sustaining condition.

A dangerous notion, which now prevails too widely, holds that a great depression in the Nineteen Fifties is unavoidable. Research studies already made by CED have convinced us that this country is not foredoomed to repeat the boom-bust cycle of the past.

Although some ups-and-downs are to be expected in a free economy, CED believes it possible to achieve much greater stability without sacrificing the freedom of choice and high living standards that have characterized the American system.

It is no more impossible for Americans to moderate the fluctuations of the business cycle by checking an inflationary boom or preventing a disastrous inflation than it was to do the supposedly "impossible" job that has already been done—prevention of mass employment right after the war.

When CED was organized four years ago many people expected that there would be eight to ten million unemployed immediately after V-J Day. This was an exceedingly dangerous idea, because it tended to create unemployment by promoting a do-nothing attitude and providing the collectivists with an excuse for proposing a group of radical measures aimed at increasing and intensifying peacetime government controls over our economy.

CED urged that instead of accepting this notion, we should get busy at once and make plans not only for quick reconversion of our enterprise from wartime to peacetime activities, but also for a substantial expansion of business far beyond any peacetime levels previously reached. Many national and local organizations, in addition to seeking aid, gave their full support to the campaign to combat post-war unemployment.

You know the over-all results—not only have we had practically no unemployment since V-J Day, but employment today is at a level that none of us would have dared predict even two years ago.

Although progress also has been made toward creation of a climate favorable to business expansion, much remains to be done to complete our program of measures with which we are seeking to assure the maintenance of normal dynamic productivity of our economy, and to moderate the instability which has characterized it in the past.

YEAR'S VACATION WITH PAY FOR 10-YEAR EMPLOYEES

Employees of American Electric Motors, Inc., Los Angeles, can now look forward to a 12-month paid vacation upon completing ten years of continuous employment. Unmarried employees will be given an annual paid holiday on their birthdays, and married employees will be given the extra holiday on their wedding anniversaries.

Primarily the company is seeking to build a permanent family of steady-working, faithful employees, and prevent any management-employee problems. By making employment an investment rather than just a job, the company expects to create invaluable good will for easing the problems of plant management, increasing production efficiency, and assuring future prosperity for both the firm and the employees.

The problem of financing the 12-month vacations will be solved through an investment arrangement

Two 2000-lb. rack-loads of enamel-sprayed metal parts are baked every two hours by each of these four DESPATCH Ovens. Racks are either mounted on floor trucks or suspended from a monorail conveyor. Note heaters mounted on platform above each oven to save floor space.

DUAL LOADING *Speeds* FINISH BAKING

DESPATCH OVENS

SPEED is the keynote of this finishing department for baking sprayed enamel on metal parts. *Speedy loading* with hand trucks or suspended from a monorail conveyor . . . *speedy baking* with four large, direct gas fired DESPATCH Finish Baking Ovens.

Equipped with a 750,000 BTU DESPATCH heater mounted on platform above, each oven bakes two 2000-lb. loads at temperatures up to 500° F. Baking time averages about one hour for each truck. For maximum flexibility in handling various sized parts and meeting different baking requirements, each oven operates as an independent unit.

Baking quality, efficiency and economy are achieved with forced convection heat, 50% recirculation of heated air and positive exhaust of solvent fumes. Oven panels have 5" Rockwool insulation and telescopic joints to permit expansion and contraction.

DESPATCH *Advantages*

● **INCREASED PRODUCTION.** 100% convection heat and 50% recirculated air gives you speedy warm-up, fast heat recovery after re-loading and fast baking.

● **QUALITY BAKING.** Heavy-duty, hi-volume fans give speedy heat transfer, assure uniform baking. Equipped with automatic temperature controls and fire underwriters' approved safety system.

● **EFFICIENT OPERATION.** DESPATCH direct gas fired heaters cut fuel costs . . . dual loading saves time and labor . . . compactness saves floorspace. Can be built with indirect oil heaters.

WRITE TODAY for Bulletin A-51.

DESPATCH OVEN CO.

Minneapolis Office: 619 S. E. 8th Street

Chicago Office: 221 N. LaSalle Street

DESPATCH OVEN COMPANY

INDUSTRY PAYS an incalculable bill each year for its inability to garner all its dust. What is your individual share of that tab? How much money, in the form of real pay dust, are you blowing away? Does your present dust-collection system approach 100 per cent recovery? Even if it is as high as 99.5 per cent, what does the remaining 0.5 per cent mean in loss to you? Only 100 lb. a day means approximately 15 tons a year.

You alone can provide the answers.

But we can offer a suggestion as to how to reduce your losses to the irreducible minimum: The **MIKRO-COLLECTOR** will keep your dust out of the air and your

Profits in the Bag.

The **MIKRO-COLLECTOR** with its phenomenal ability to handle even those damp and hitherto baffling dust loads . . . its revolutionary principles, which assure a perpetually clean filter, marking the first radical change in the art of dust-collection in a quarter century . . . supplements our line of MIKRO-PULVERIZERS and MIKRO-ATOMIZERS in use throughout the world. But it performs with equal efficiency as an auxiliary to any type of grinding machinery, or in general air-clarification.

The value of the **MIKRO-COLLECTOR** in dollar-and-cents . . . its ability to amortize its cost quickly . . . lies in its 99.99 per cent minimum recovery of most solids even in the low micron ranges.

When you want COMPLETE recovery . . . whether of dry dust or dust containing a considerable percentage of water or oil. . . . it will pay you to investigate the performance of this equipment. Write for your copy of the **MIKRO-COLLECTOR** Bulletin.

By way of **EYE-PROOF**

1—A freshly laundered white handkerchief, held over the exhaust during the filtration of finely ground colored pigment, shows no discoloration.

2—After days of such operation, the outer surface of the cylindrical, felt filter bag remains as clean as when first installed.

THE
MIKRO-COLLECTOR
will be on display at the
Exposition of Chemical Industries,
Grand Central Palace, N. Y. C.
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Booth 300-02 Mezzanine Floor

PULVERIZING MACHINERY COMPANY
24 Chatham Rd., Summit, N. J.

1325

whereby a sum of money will be set aside for each new employee. After ten years, this money plus its accrued interest will pay for the employee's year of vacation.

To meet the problem of temporarily replacing key men taking a 12-month vacation, an extensive employee training program is planned. The company does not anticipate having any large number of employees on a vacation during any one year.

Because the company is relatively young, the first 12-month vacation cannot be taken until 1956. American now has some 50 full time employees. However, it is expected that this number will substantially increase following completion of a plant addition which will double manufacturing floor space.

LABOR LAW EXPLAINED IN LETTER TO WORKERS

Soon after the passage of the Labor-Management Relations Act, the following letter was written to employees of the Caterpillar Tractor Company by its president, L. B. Neumiller:

So much has been said in the newspapers and over the radio about the new Labor-Management Relations Act of 1947 (Taft-Hartley Bill) that there probably is some confusion about it. Now that we have a new law, every interested person should understand it.

In the first place the new law includes most of the provisions of the Wagner Act which it now replaces. While the new Act is quite long, I believe you will be interested in some of its major points.

Contrary to what some have been led to believe, the new law does not deny employees the right to engage in lawful strikes. There are, however, some provisions making strikes illegal during specified periods—for example, the government may obtain 80-day court injunctions in strikes or lockouts endangering national health and safety. In such cases of national emergency, if mediation fails and employees turn down management's last offer in a National Labor Relations Board election, then the injunction would be withdrawn and the case referred to Congress.

The new Act prohibits closed shop contracts which require an employer to hire only union members. However, an employer and union may agree upon a "union shop" if such

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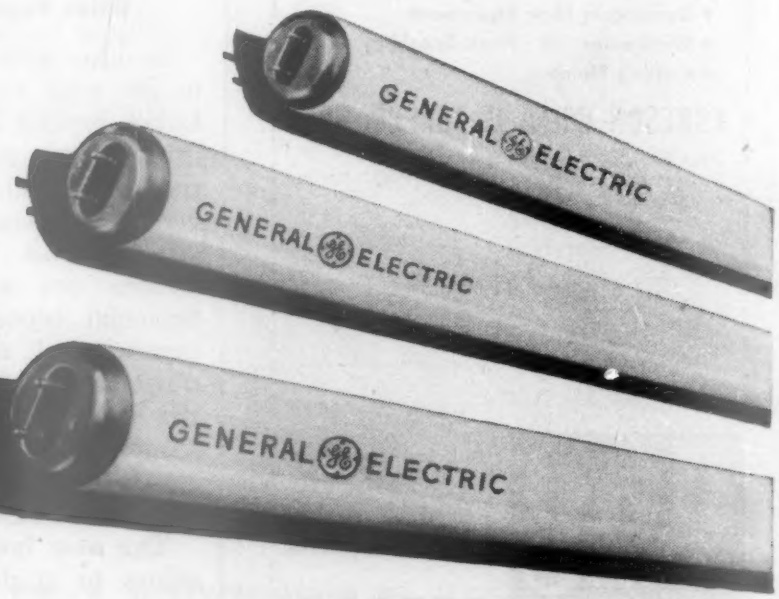
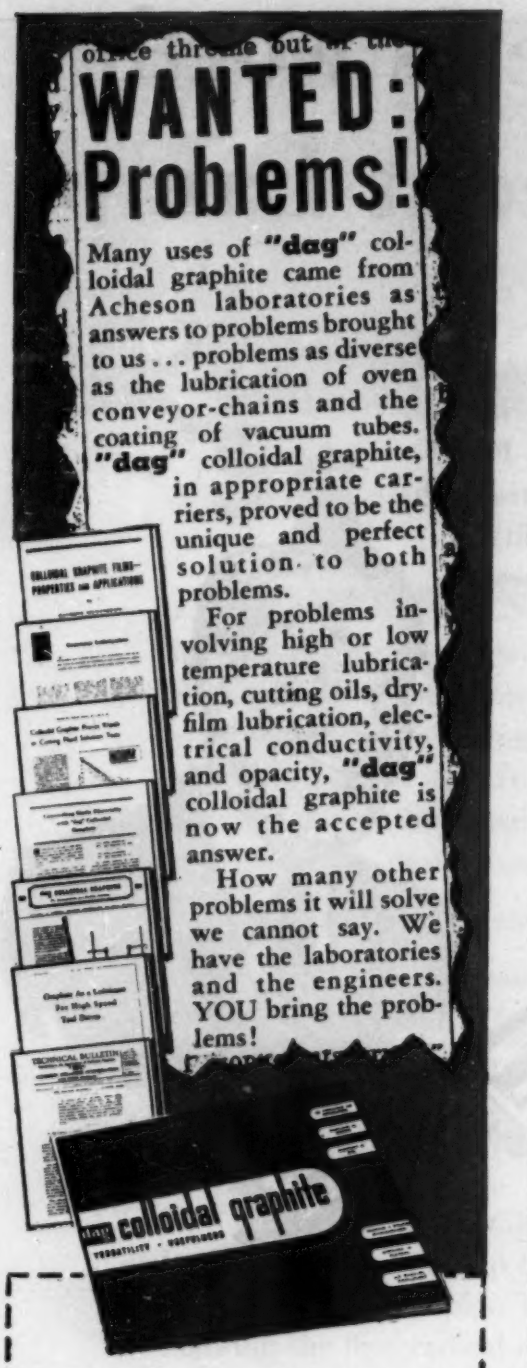


G·E LAMPS

GENERAL ELECTRIC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THEY SAY AND DO *(continued)*

a provision has been approved in a secret ballot by a majority of employees in the bargaining unit.

The old law defined unfair labor practices for employers only. The new law defines unfair labor practices for both unions and employers; for example, under the new law a union may not charge excessive initiation fees or coerce employees into joining the union.

Check-off System

While the new law does not alter present contracts, it specifies that under future contracts an employer may not deduct dues from the earnings of an employee and turn them over to the union unless the employee has signed an individual authorization.

Previously only an employer could be sued for breach of contract, whereas now either the employer or the union can be sued. Employees or other injured parties also can sue for damages resulting from a jurisdictional strike or secondary boycott, such as in the case when a union attempts to force an employer to stop dealing with another employer or to stop using, selling, handling, or transporting its product.

Under the old law only employers were restricted in making political contributions and expenditures. Now both employers and unions are so restricted.

The new law provides for the reorganization of the present National Labor Relations Board and for the creation of a new independent mediation and conciliation agency.

Neither unions nor employers will be allowed under the new law to cancel a contract without giving a 60-day notice during which period a strike or lockout would not be allowed.

Union Reports Must Be Filed

Another provision requires unions to file with the U. S. Secretary of Labor reports showing, among other things, the names, compensation, and methods of selection of officers, procedure and conduct of internal union affairs, and full financial data. Unions are also required to file financial reports and to distribute copies to all members. An affidavit must also be filed by each officer of the union stating that he is not a Communist or a member of any group advocating the overthrow of the government.

The new law sets forth a code of ethics to guide the parties in col-

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lective bargaining and requires the union as well as the employer to bargain in good faith.

Such are the major provisions. We believe that the new law will permit improvement in our existing labor-management relationships. It seeks only to provide greater equality before the law for all interested groups. Present contracts will continue in force without change, and will stay that way until changed by the process of orderly collective bargaining.

We should remember that most new laws, like new machines, may be subject to some operating difficulty. However, as experience grows with time, the "bugs" are worked out of both machines and laws, and they are soon developed into smoothly operating processes. The new law, like all laws governing the conduct of people, calls for understanding and teamwork. It is our belief that it affords the opportunity for labor and management, working together, to achieve even higher goals.

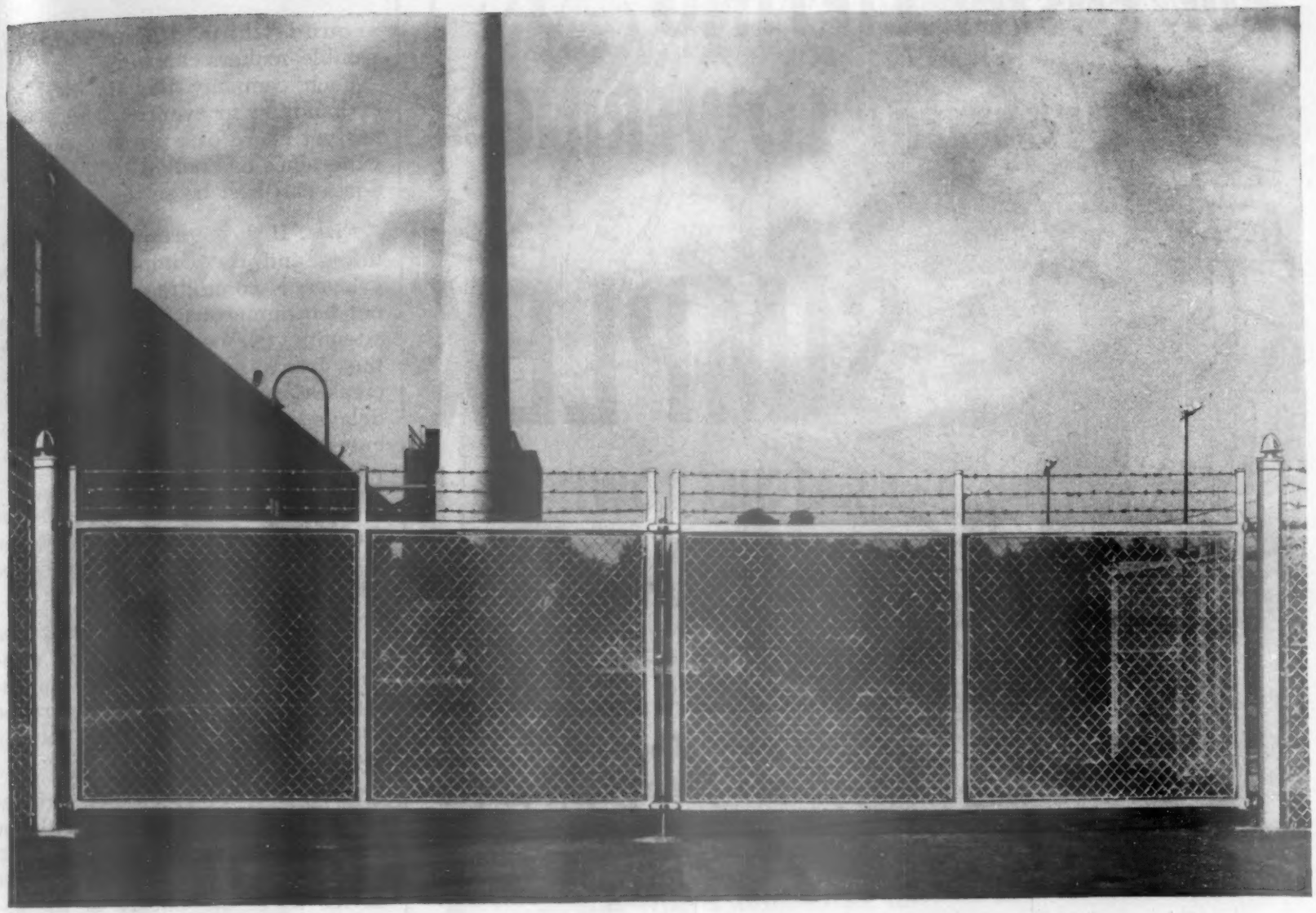
If you have an opportunity to study the full text of the new law by all means do so. I feel certain that you will find that its major purpose is to protect employees, employers, unions, and the public.

WAYS TO HANDLE AND PREVENT GRIEVANCES

PARKER C. WILLIAMS, Director of Industrial Relations, White Motor Company, speaking before American Management Association

A sincere grievance is nothing to consider lightly. In many plants and offices, the vast majority of employees have never filed a grievance. To many employees, the filing of a grievance is a step which they long seek to avoid, and which they have adopted only after much thought and with great hesitancy. It is often the last resort — prior efforts to alleviate the causes of the grievance having failed.

To a reasonable employee, a grievance is a most important matter, and the way in which the company handles the grievance often impresses the employee for good or ill. It is something which he will long remember. The method of handling grievances can often spell the difference between developing an employee who is willing to cooperate with the union and the company toward building good attitudes, or a disgruntled employee who becomes a source of difficulty for his supervision, as well as a personality



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Anchor Chain Link Fence and Gates will help direct your plant's flow of motor traffic and employees a lot more systematically. We'll install it where it will do the most good in giving you efficient control over production, shipping and receiving operations.

What's more, this sturdy fence will also safeguard outdoor storage of materials and protect your plant against trouble-makers. You're sure of longer-lasting protection with an Anchor Fence, too, because of several *exclusive* features like *Deep-Driven Anchors*. They are clamped to the posts at right angles to the fence line . . . form a 3-point "tree root" anchorage deep in the sub-soil which keeps the fence erect and in line, in any soil or weather; yet permit easy relocation at any time.

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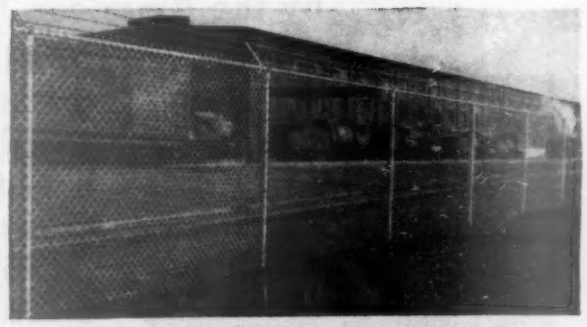

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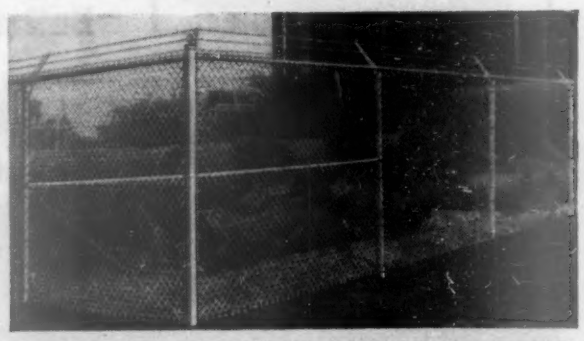
Installing an Anchor Chain Link Fence at your plant is the best way to shut out trespassers, agitators, all kinds of trouble-makers.



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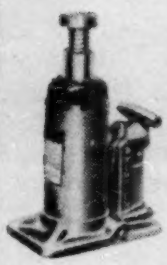

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around whom discontents and trouble-makers can rally.

Each company has its own way of handling grievances, and I have not yet heard of a perfect way. Our experience has taught us that grievances can best be settled:

First: If the representatives of the union and the company attending grievance committee meetings are not too numerous. When the groups attending the meetings become large, the desire for speech-making increases, and this not only greatly delays the proceedings, but also decreases the opportunity to concentrate upon the facts.

Second: If the grievance is reduced to writing and the discussion is limited to the specific grievance on file.

Third: If a thorough investigation has been conducted by the company representative before an answer is given, and if the interested parties have been able to explain their positions.

Fourth: If the company's representative has full power to settle the grievance, or has ready reference to top management so he can receive advice as to the nature of the answer to be given.

Fifth: If supervisors are informed of the nature of grievances presented and of the company's position in reply to them.

Sixth: If the approach to the decision is upon the basis of *what* is right and not on *who* is right.

If your employees are represented by a union, you may at times wonder if your endeavors to cultivate a real interest in the employees, as individuals, are really understood by the union. You may often feel that your purpose has sometimes been misinterpreted.

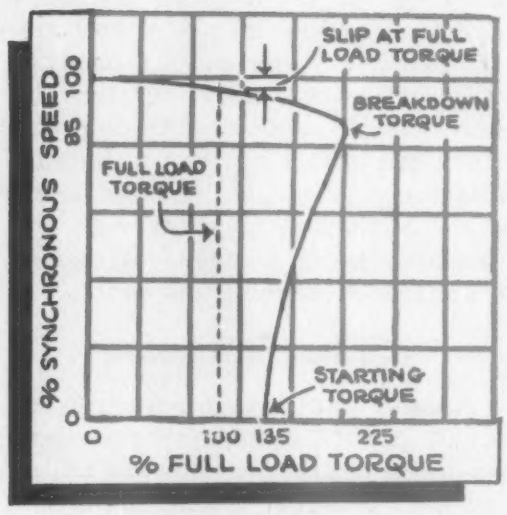
Yet, I am confident that every sincere effort is worthwhile. Friendliness and genuine interest in the welfare of the individual by the employer is not yet barred by any collective bargaining agreement with which I am familiar. We must not require the employees to go to the union hall or to union meetings in order to find sympathy, understanding, and good will.

Leadership Important

If you are fortunate enough to have good leadership within the union, you will have a real aid toward developing this attitude of good will, teamwork, and under-

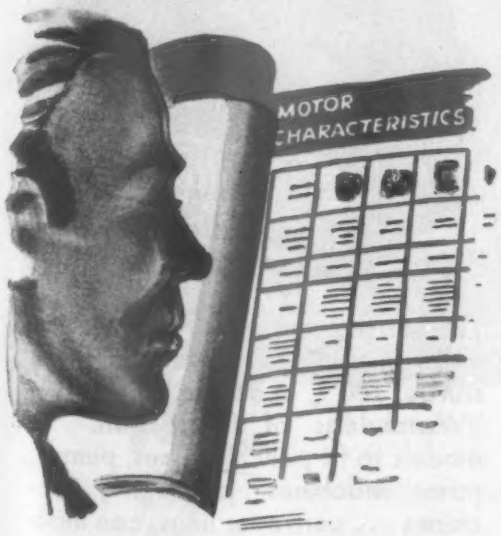
Here's One Way to Choose Motors...

Sure, Your Local "Swami" can pick a motor for you in an instant! But if you want motor counsel you can *bank* on . . . you'll consult a reputable motor manufacturer. In place of crystal-ball gazing, he'll advise you to follow *practical* and *orderly* steps in arriving at *right* motor selection. For example...



First, Study Your Power Supply . . . voltage, frequency, number of phases; the p.f. required by your utility. Judicious selection will help balance your motor capacity . . . lower power costs. And check the voltage regulation — choose motors with enough torque to start and carry the load. Next . . .

Study the Driven Machine and surroundings. What hp? What starting torque? Will you need a horizontal or vertical motor — direct-connected, belt-driven or gear-operated? How about surroundings — ambient temperature, moisture, corrosion, dust. Each calls for a particular type of protection. Now . . .



Study Your Motor Characteristics. *A-c motors?* For most jobs they're satisfactory and economical. *D-c motors?* For wide speed range; for fast acceleration or reversal they may prove your best bet. *Synchronous motors?* When applicable they give you low-cost p.f. correction. You're *still* undecided? Call in your nearby Allis-Chalmers motor expert. He'll be glad to help you decide—with recommendations backed by 50 years of motor-building!

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standing. Let us endeavor to show our employees, and through them the union, that the company and the union are not adversaries for the employees' loyalty. Rather, let us emphasize that the company and the union are working *together* to improve morale, working conditions, and production, and thus prevent the necessity of filing many grievances.

I believe this can be accomplished by various means. First, a well organized labor-management committee, meeting at not too infrequent intervals, can aid in impressing the union with the company's sincerity in trying to improve conditions. A policy of frank discussion at these meetings of the mutual problems and joint responsibilities of both the company and the union, together with an honest searching for the best possible solution of these problems, can go a long way in helping allay any suspicion that the company is working at odds with the union or seeking means of undermining or weakening the union.

Suggestion System Useful

Another method of assuring the union that the company is sincere in its desire to cooperate toward building good attitudes among employees is by means of an active suggestion system.

A suggestion system will be especially effective in this regard if the suggestions are read and considered at a meeting attended by both company and union representatives. Representatives of the union should also be included on the jury of awards, which determines the amount of cash paid to employees who have submitted the suggestions which have been adopted. One interesting feature of this plan is that in the years we have used this procedure, the awards voted for by the union representatives on the jury of awards have, in a majority of the cases, been for amounts considerably less than the cash awards voted for by the designated representatives of management.

Still another way to prove to the union—and through the union, the employees—that the company is interested in preventing grievances—is through the establishment of a joint health and safety committee.

Methods Used In Direct Approach

Now, let us consider several ways of proving to the employees directly, rather than through the union, the

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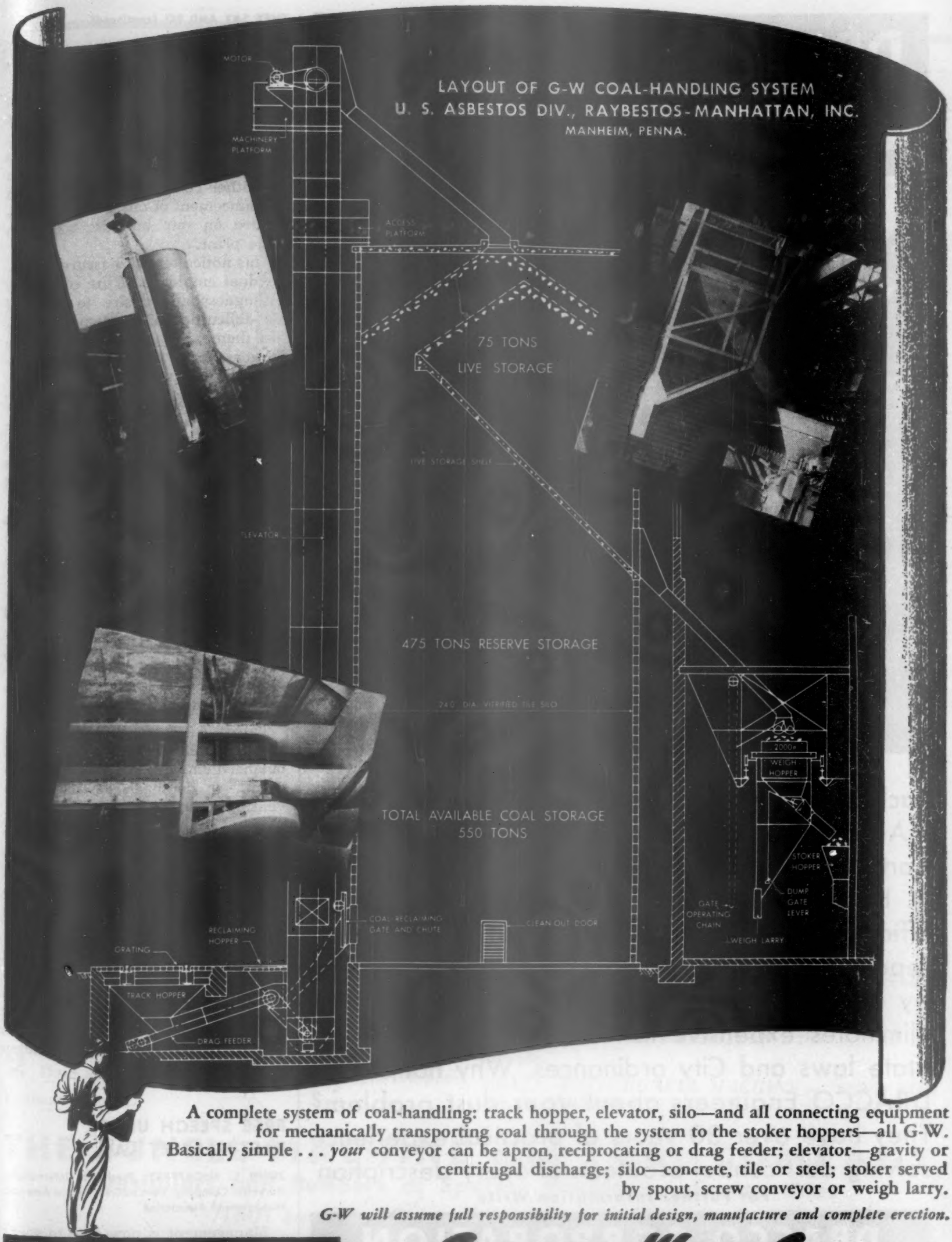

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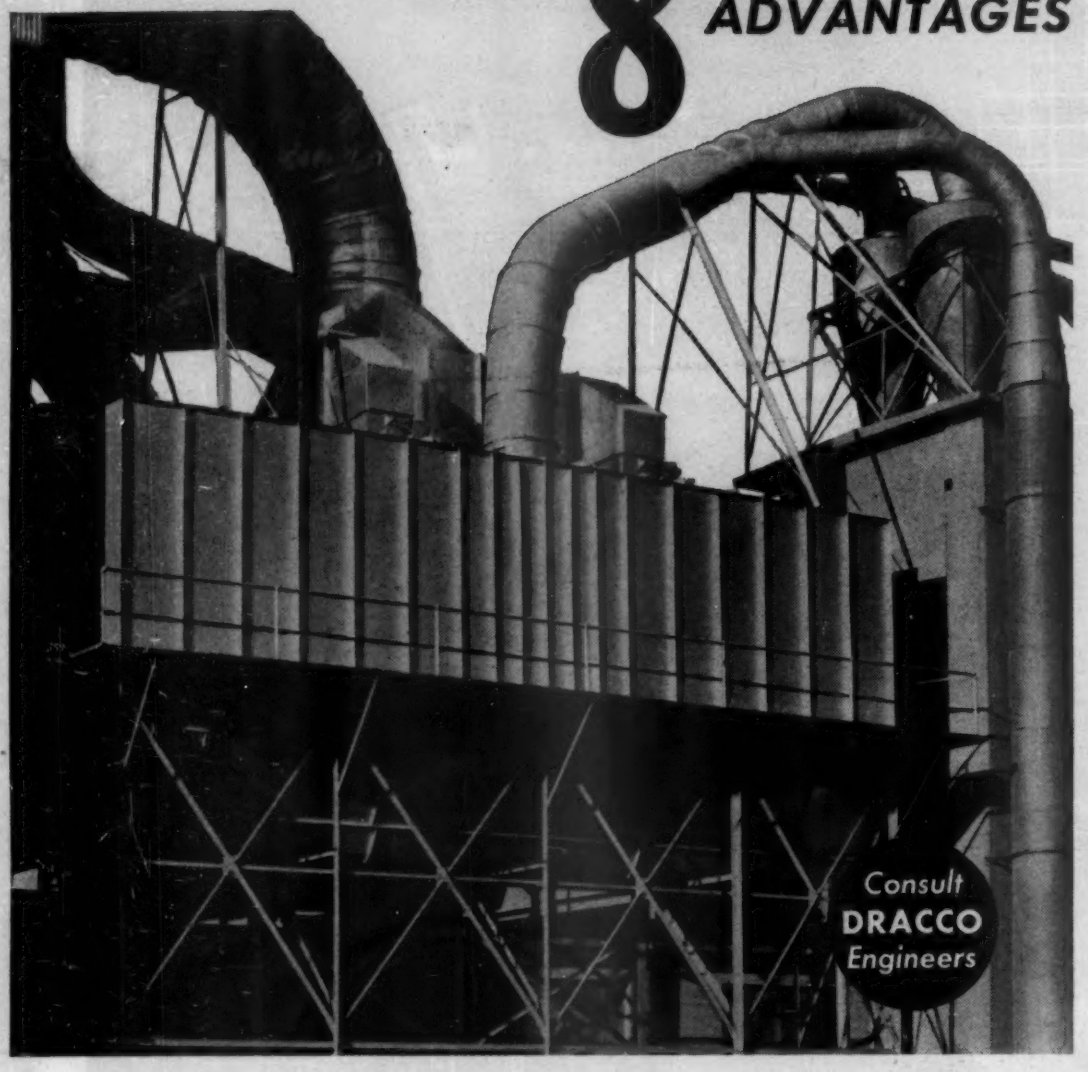

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company's desire to prevent grievances:

First: A clear-cut statement of the company's desire to be informed of the employees' difficulties is a step in the right direction. Some years ago, following the practice used by a few other companies, we placed an announcement of our grievance procedure on our bulletin boards in large print.

This notice tends to assure the individual employee of the company's willingness and desire to learn of his difficulties and attempt to adjust them, and it also recognizes the foreman as the one having authority to settle grievances.

Second: To prove to the individual employee the company's desire to prevent grievances, and publish the activities and accomplishments of the various labor-management committees.

Special emphasis on the occasions in which the union has worked hand-in-hand with management in improving conditions or in increasing production will go a long way toward convincing the individual employee that the union and the company are not two hostile camps, constantly maneuvering for position, ever alert to advance at the expense of the other.

Third: A wise and skillful use of a plant publication, as well as a well balanced employee recreational program, can do much to aid in preventing grievances among employees.

Fourth: Any employee who is or has been a member of any of the various labor-management committees has had an excellent opportunity, as an individual, to see at first hand the company's intentions.

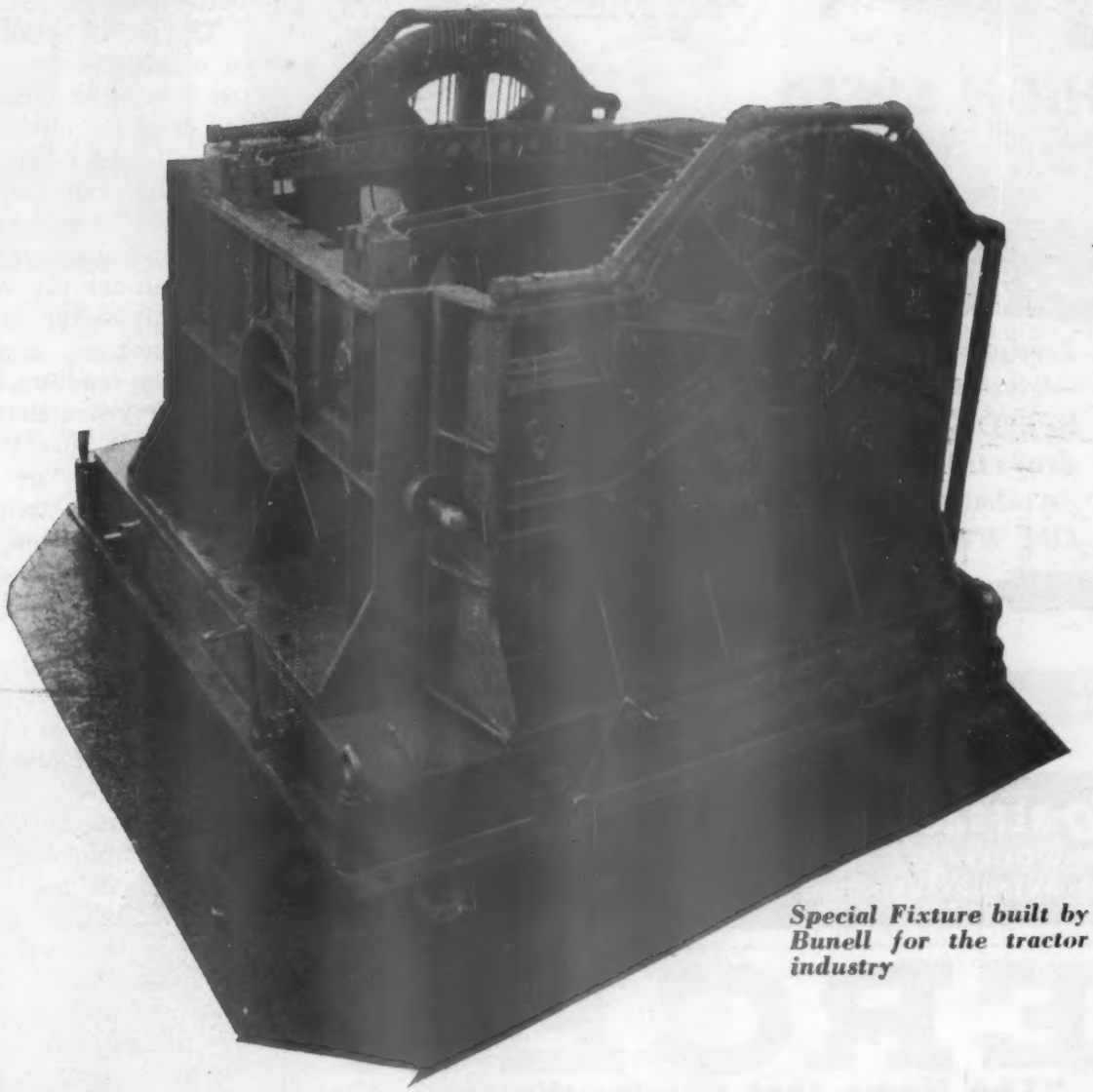
Fifth: A well developed training program, providing for the unrestricted exchange of ideas between employees and the instructor, often results in securing ideas which can be put into practice, thus eliminating many grievances.

FREE SPEECH UNDER TAFT-HARTLEY LAW

JOHN L. McCAFFREY, President, International Harvester Company, from address before American Management Association

Management is now free to speak its mind on matters of collective bargaining. Under the new law, we have a clear right to free speech. We can say what we think to our employees or to anyone else, so long as we do not threaten our em-

A Four-Phase Service



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CUT-OFF WHEELS
Against Anything

Ferrous and non-ferrous metals—even ceramics—give way to the grinding cuts of Electro HIGH SPEED CUT-OFF WHEELS and partition time drops from minutes to *seconds.* No other method, no other tool, equals Electro HIGH SPEED CUT-OFF WHEELS for speed, safety, metal saving.

Send for Grinding Wheel Manual 645 in full color. It's free and completely informing.

Service from Los Angeles or Buffalo

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"The Name that Carries Weight"
MATERIAL HANDLING EQUIPMENT

TRAILER TRUCKS

Trailer Trucks, Elevators, Conveyors, Wheel Tractor Cranes... Material Handling Equipment of every type. Designed to your requirements by experienced engineers whose reputation is founded upon doing things right. Literature available. Inquiries invited!

T-701—4 Wheel Steer
4 Ton Capacity

MERCER ENGINEERING WORKS, INC.
Plant: Clifton, N. J.
SALES REPRESENTATIVE
MERCER-ROBINSON COMPANY, INC.
30 CHURCH ST., NEW YORK 7, N. Y.

ployees or promise them any rewards for adopting our views.

This right, I believe, offers a pitfall on one hand and a high road to better days on the other.

The pitfall is the danger that some in management may be tempted to use this right of free speech merely to criticize unions or individual union leaders. That might be understandable, but it would not be wise. It would be understandable because some managements went through years, under the Wagner Act, when their character was attacked and their motives impugned by every publicity medium known to unions. And for years they had to sit mute and take it. Now there may be some temptation to "get even."

Where that temptation exists, it should be resisted. Anyone can call names. Anyone can carp and criticize. You know that, I know that, and I believe our employees know it. I believe employees have always discounted – and discounted pretty accurately—a lot of the wilder statements that unions made about companies or about individual members of management.

Our employees do not look to management for that kind of behavior. They look to us for constructive leadership. The strength of management is our ability to create, to move forward, to do positive things, and that is the way we ought to employ our freedom of speech.

In using freedom of speech that way, I believe we can find a road to better days. I think this is one of the great positive benefits of the Taft-Hartley Law, and if we in management fail to use it, we ought to suffer the penalties.

Give Workers Facts

How should we use free speech? Primarily, in my opinion, to inform our employees. Not to argue with them, not to propagandize them, but to inform them, to give them FACTS, in the confidence that when employees know facts their own fairness and intelligence will lead them to the right decisions.

In my company, we believe this very strongly. Before the Taft-Hartley Law was passed, or even introduced, we had begun a program designed to tell employees about our business. We are extending and increasing our efforts along that line. We have gone far enough now to know that we are on a road of great promise.

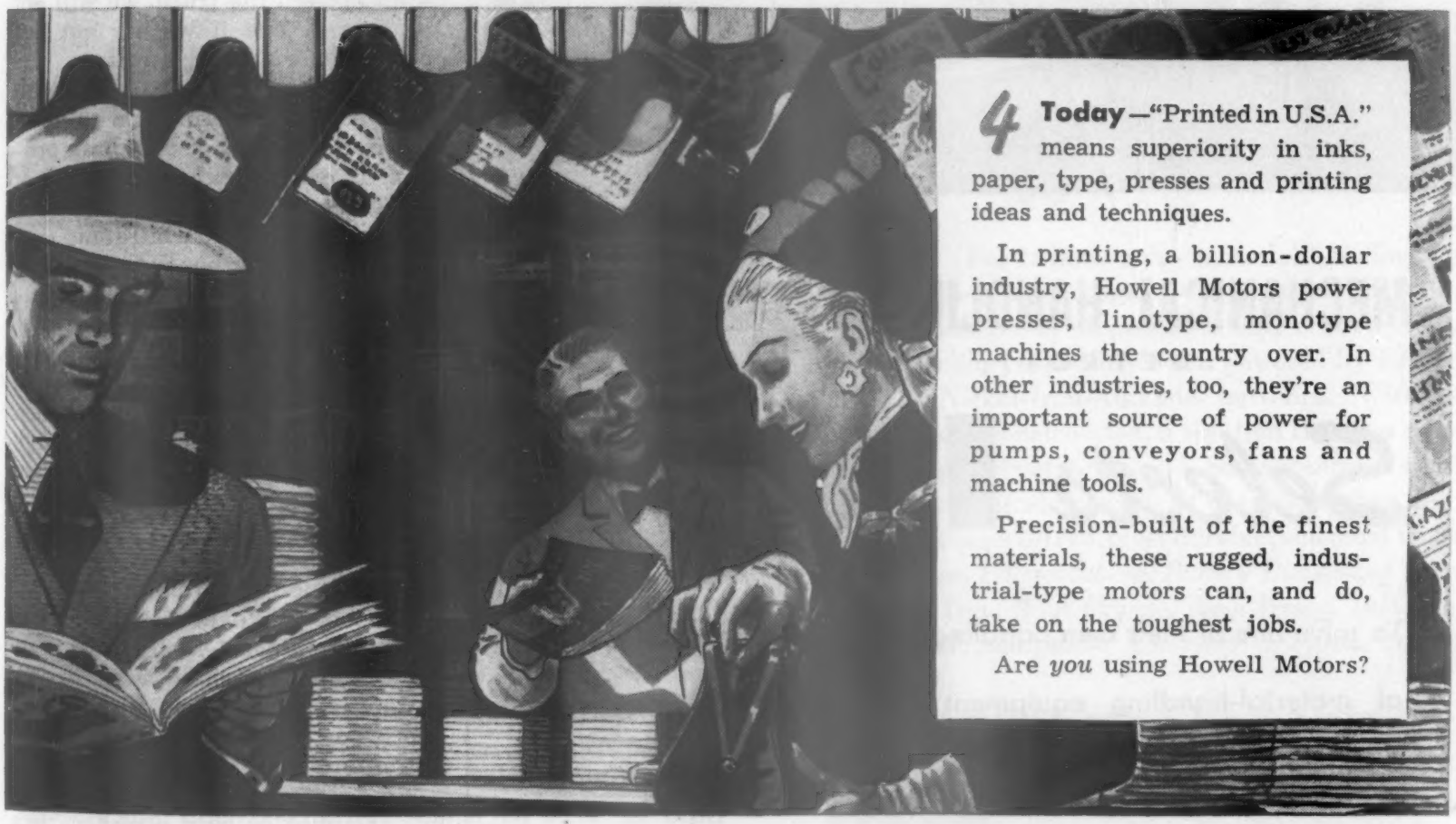
We started with this idea: Our

1 **1450**—First printing presses stemmed from cheese or cider presses. Gutenberg's hand press used type carved from wood and metal. Four centuries later printing was still largely a manual operation. But the Industrial Revolution was near.

2 **1875-95**—Electric power revolutionized printing. Hand work gave way to powered presses and machines. Foot treadles and hand cranks disappeared. Low cost electricity started printing on its way to becoming a modern art.

3 **1930**—Whereas, Gutenberg was 7 years printing 200 copies of his Bible—presses of the thirties did the job in 20 minutes! In 1915 Howell "Red Band" motors were introduced. They won instant acclaim in this and other industries.

"Printed in U. S. A."—and how!



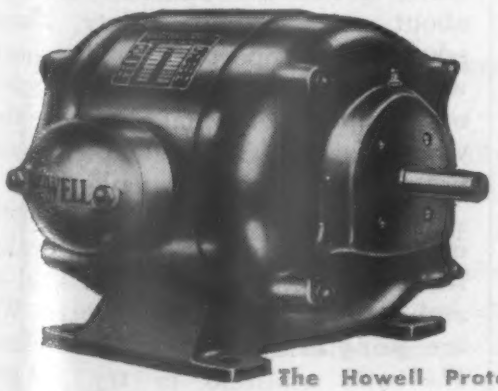
4 **Today**—"Printed in U.S.A." means superiority in inks, paper, type, presses and printing ideas and techniques.

In printing, a billion-dollar industry, Howell Motors power presses, linotype, monotype machines the country over. In other industries, too, they're an important source of power for pumps, conveyors, fans and machine tools.

Precision-built of the finest materials, these rugged, industrial-type motors can, and do, take on the toughest jobs.

Are *you* using Howell Motors?

Here's another precision-built Howell Motor . . . industrial type with copper or bronze rotors . . . specially insulated . . . statically and dynamically balanced.



The Howell Protected Type Motors

HOWELL MOTORS

HOWELL ELECTRIC MOTORS CO., HOWELL, MICH.

Manufacturers of Quality Industrial Type Motors Since 1915

MECHANICAL HANDLING SYSTEMS, INC...
DETROIT, MICHIGAN

Selects ROSS

To solve one of their own handling problems, this manufacturer of material-handling equipment selected a *ROSS* five-ton pneumatic tired *LIFT TRUCK*. Subsequent experience has more than justified this choice . . . For efficient all-weather handling of big, bulky loads on dirt, cinder or paved roads, *ROSS* insures you uninterrupted service. Six models, capacities, 5,000 to 18,000 lbs., hydraulic hoist, gasoline powered.

Rely On ROSS

THE ROSS CARRIER CO.
295 MILLER STREET, BENTON HARBOR, MICHIGAN, U.S.A.
Direct Factory Branches and Distributors Throughout the World

company is not just the stockholder's business or management's business. It is the employees' business too. They work with us every day. They influence everything we do. Therefore, they have a right to know and we have an obligation to tell them what the company is doing, why it is doing it, and what we hope the results will be.

Our employee information program includes employee letters, managerial letters, magazines and special publications. All kinds of media can be helpful. But a basic policy has to be there first or the finest methods in the world won't help.

Program Must Be Straightforward

The keystone of an information policy has to be candor. We have to be able to explain what we are doing, and why, without any mental reservations or weasel words. For if we do not tell the truth, we will not be believed, and if we are not believed we are wasting our time.

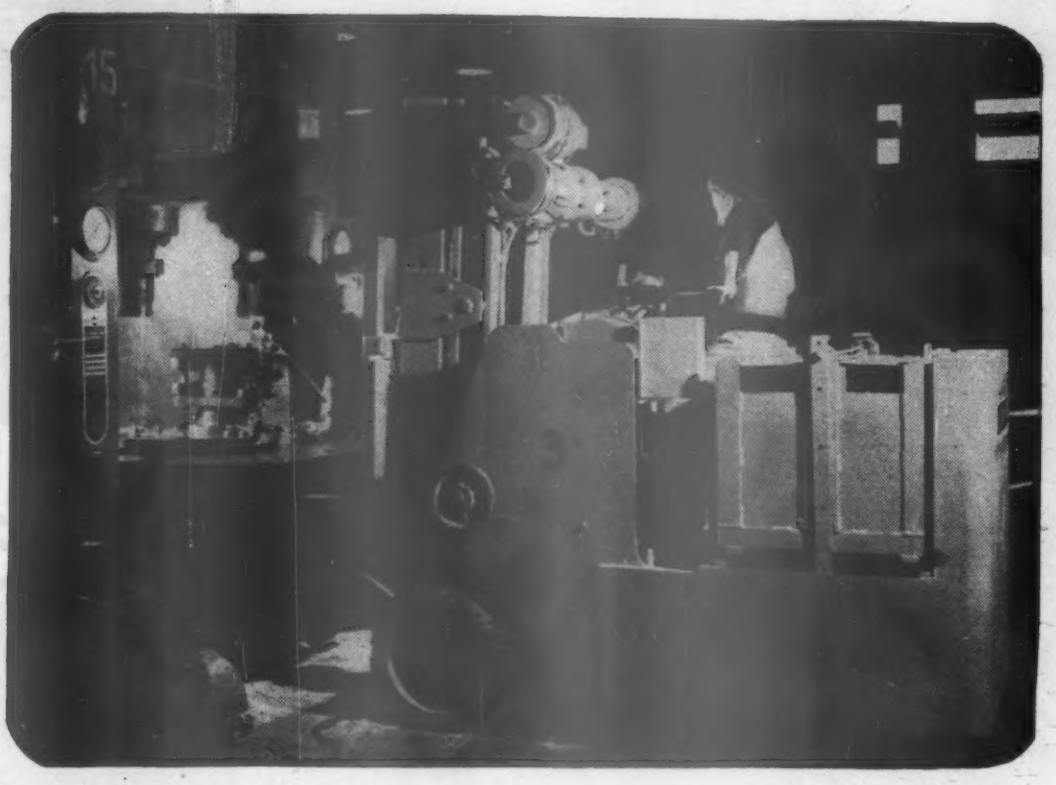
That means taking the bitter with the sweet. An information program for employees cannot be a brag program. It cannot be just a recital of management's successes. If we report this week an arbitration case that the company has won, we must be equally prepared to report arbitration cases that the union wins. If we are prompt to tell employees when we increase wages, we must be equally prompt to tell them when we increase dividends, even though we know that few employees are going to cheer about an increase in dividends.

Our information program is not an anti-union program. It will not become one. We are interested in only two things – seeing that employees get the whole story of important activities that affect them, and seeing that they get this information promptly.

We do not talk only when we are in difficulties or only about matters of labor relations. We talk about production, about capital expansion, about materials procurement, about sales, about the business outlook, about prices, about safety, about educational opportunities. In short, we talk about anything that will give our people a better chance to see the whole forest of the company, and not just their own particular tree.

We believe that men work more effectively and more enthusiastically when they know what the goal is and how we plan to get there. We are going to talk more and not less. We will continue to try to get

Handling Work is **STOP** *and* **GO**



and Needs Instant-On-Off Power

In replacing a loaded skid box with an empty beside a machine, an industrial truck will make an average of approximately 14 moves forward, backward, up and down. A battery industrial truck has a natural advantage in this kind of stop-and-go service because it gets the necessary surges of power instantly from its battery, yet consumes no power during the stops. Thus it is not only economical of power, but the electricity used for charging its batteries is low-cost power.

Its electric-motor drive operates quietly, without vibration, and thus with well-nigh negligible repair requirements. With batteries exchanged two or three times per 24 hour day, it is continuously supplied with power and, since one battery is charged while the other works, the truck need not stop work for servicing of its power unit.

For 24 hour-a-day material-handling work, therefore, a battery industrial truck is an inherently dependable and economical machine, especially when powered by EDISON Nickel-Iron-Alkaline batteries. With steel cell construction, a solution that is a natural preservative of steel, and a foolproof electrochemical principle of operation, they are the longest-lived, most durable, and most trouble-free batteries. *Edison Storage Battery Division of Thomas A. Edison, Inc., West Orange, New Jersey.* In Canada: *International Equipment Company Limited, Montreal and Toronto.*

EDISON

Nickel • Iron • Alkaline

STORAGE BATTERIES

In Industrial Trucks, EDISON Nickel-Iron-Alkaline Batteries Give You These Important Advantages.

1. They are **durable mechanically;** grids, containers and other structural parts of the cells are of steel; the alkaline electrolyte is a preservative of steel. 2. They can be **charged rapidly;** gassing cannot dislodge the active materials. 3. They can **stand idle indefinitely** without injury. Merely discharge, shortcircuit, and store in a clean, dry place. 4. They are **simple and easy to maintain.** 5. They withstand **temperature extremes;** are free from freezing hazard; are easily ventilated for rapid cooling. 6. They are **foolproof electrically;** are not injured by short circuiting, reverse charging or similar accidents.

To get it faster look in

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One hundred and ninety-five manufacturers' catalogs—1,520 catalog pages—instantly accessible in the 1948 Sweet's File for the Process Industries. There, right in your office, you will find up-to-date, useful and comprehensive information on forms, characteristics, performance and use of a wide range of materials, equipments and services.

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Free

to qualified organizations and individuals

S

everyone in our business interested in our problems and in the solution of them, so that we all move ahead together.

I believe that it should be a basic policy of every management to use to the full this freedom of speech now provided us by the Taft-Hartley Law.

ANOTHER COMPANY CELEBRATES 100th YEAR

Worthy of note in this land of free enterprise and high business mortality is the one hundredth anniversary of any manufacturing concern. Thompson and Company, of Oakmont, Pa., has reached its one hundredth birthday. The company manufactures paints, varnishes, and lacquers. It has issued an attractive brochure commemorating the occasion. The brochure is both informative and historical.

AMERICA SEEN HEADED FOR TOTALITARIANISM

JAMES F. LINCOLN, President, Lincoln Electric Company speaking before the National Hardware Association, American Hardware Manufacturers Association, and National Association of Sheet Metal Distributors and Accessories Branch

The majority of people in the United States undoubtedly are attempting to have government control everyone's destiny. We can be sure there will be some form of totalitarianism within a comparatively few years.

If the average American recognized what the future must be with his present philosophy, he would resist it to the end, because he doesn't want to lose his freedom. Therefore, the hopeful aspect of the situation is that after we have had totalitarianism for a period of one or more generations, there will undoubtedly be a revolution which will bring back the freedom which we are now sacrificing.

That the period of regress is imminent is disturbing, but history shows that it is only so that progress has been made. American people are looking to government to give social security, to give jobs, to take care of each individual in his old age, etc., and as government is given more responsibility it must change from a representative form to a totalitarian form, since only so can these possibilities be assumed. We have gone a long distance in that direction.

We cannot continue the chaos of

NON-CORRODING "ALLENS"

for applications where steel is subject to excessive moisture, chemical fumes or corrosive vapors. Made of "18-8 Type" *Stainless,* non-heat treated, non-magnetic. Set screws: stock sizes #6 to ½" diameter; cap screws: #8 to ½". N.C. threads only. Class 3 fit; Allen precision fastenings. . . Order of your local Allen Distributor, or write us for samples and literature.

THE ALLEN MFG. COMPANY
HARTFORD 2, CONNECTICUT, U.S.A.

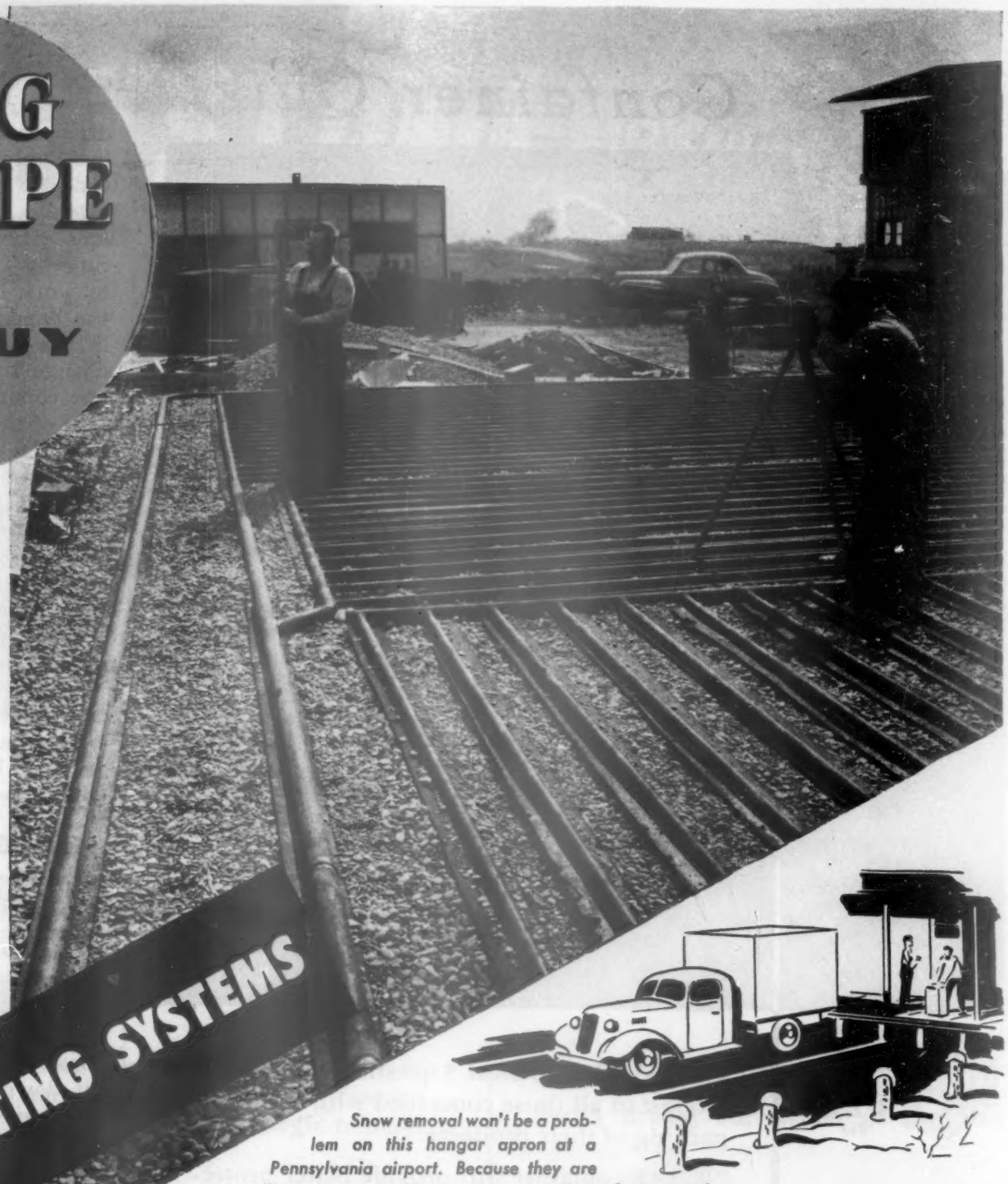
SPANG CW PIPE

is your

BEST BUY

FOR

SNOW MELTING SYSTEMS



Snow removal won't be a problem on this hangar apron at a Pennsylvania airport. Because they are installing a snow melting system consisting of pipe grids, through which hot water fortified by anti-freeze will be forced.

Next time you install a snow melting system, recommend Spang CW Pipe. It has every one of the qualities needed by pipe for that kind of an installation . . . and here they are:

- —Approximately the same co-efficient of expansion and contraction as concrete.
- —Good bending qualities.
- —Excellent weldability.
- —Good surface heat output.
- —Uniformly sound weld from end-to-end.
- —Low cost.

Remember, most snow melting systems are just another version of closed hot water systems . . . and that Spang CW Pipe is giving complete satisfaction in thousands and thousands of such systems.

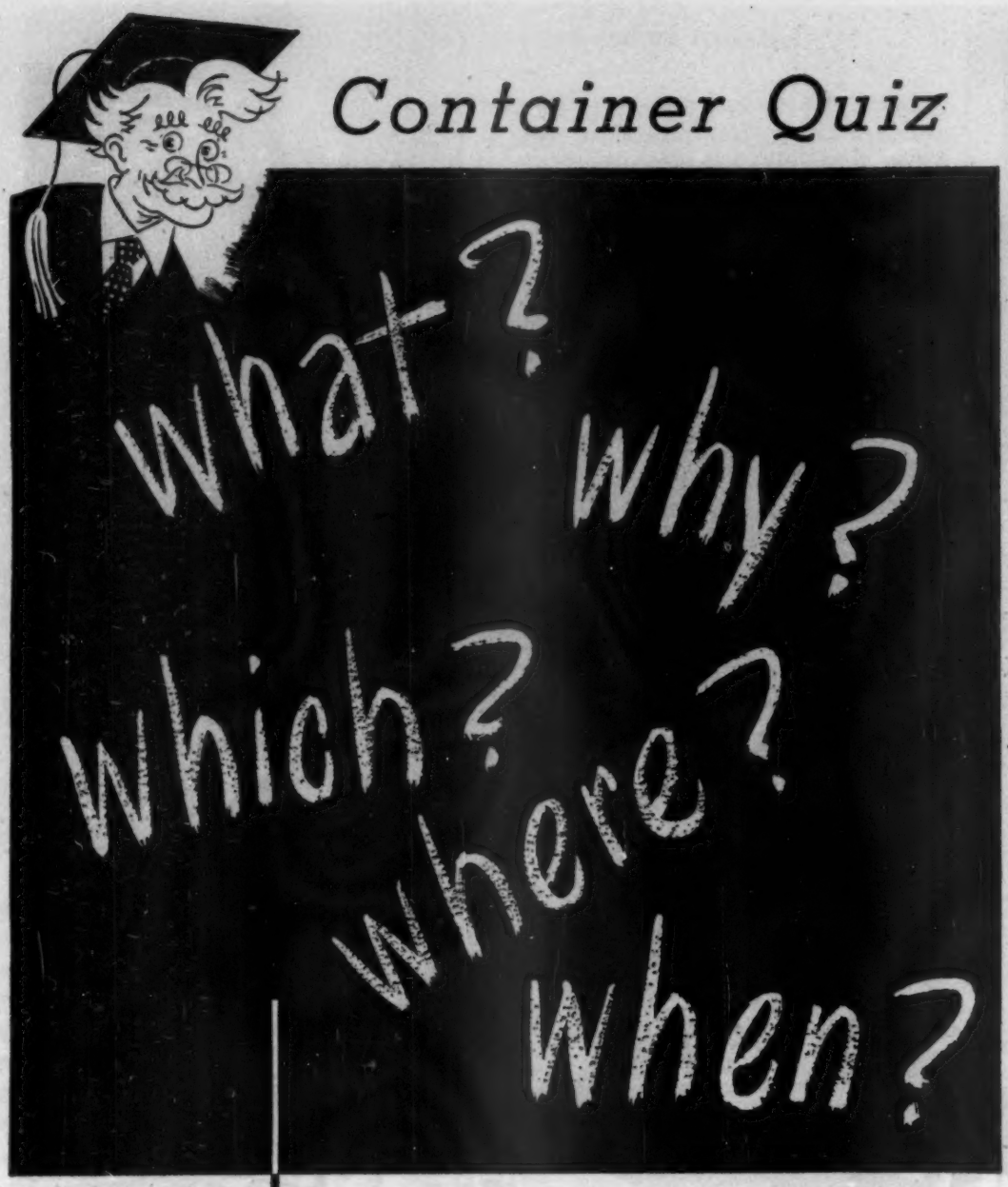
While your snow melting installations, (or other jobs) are in the formative stage, contact your Spang distributor and place your order *early*. That way you will help him to make your delivery on time.

SPANG-CHALFANT

Division of The National Supply Company

EXECUTIVE OFFICES: PITTSBURGH, PA.

District Sales Offices: Atlanta; Boston; Chicago; Denver; Detroit; Houston; Los Angeles; New York; Philadelphia; Pittsburgh; St. Louis; San Francisco; Tulsa



• The answers to these 5 questions are of vital interest to all those concerned with the better packing of their products.

"*WHAT* container will provide better protection, will best ship our products?" We think that General Boxes will provide better and more economical protection for your products.

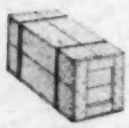
"*WHY*?" Because they're designed specifically to the product, as a "Part of the Product."

"*WHICH* type of container will do the most efficient job?" The answer to this important question is provided by our Engineering Service.

"*WHERE* is this service available?" For complete information just write our nearest office.

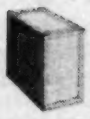
"*WHEN*?" . . . is best answered by your doing this right now.

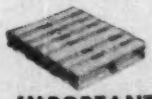
General All-Bound Box


General Nailed Box

General Corrugated Box

General Wirebound Crate


General Cleated Corrugated Container


Generalift Pallet

IMPORTANT NOTICE: *New plants and expanded production facilities are now in full operation. Your inquiry or order will receive* prompt attention.

ENGINEERED SHIPPING CONTAINERS

25 YEARS YOUNG
1922-1947

General BOX COMPANY

GENERAL OFFICES: 504 N. Dearborn St., Chicago 10, Ill.
DISTRICT OFFICES AND PLANTS: Brooklyn, Cincinnati, Detroit, East St. Louis, Kansas City, Louisville, Milwaukee, New Orleans, Sheboygan, Winchendon, Natchez.
Continental Box Company, Inc.: Houston, Dallas.

collective bargaining with its wars and destruction. That will mean the disappearance of our economy and inevitably lead to totalitarianism. In order to mend the present situation of low production by workers, a whole new approach is necessary. Since we cannot force the worker to work by any device now left in the hands of management, we must find a way of making the worker change his attitude. Since we cannot command, we must make him part of the team of management and men. He must be a real member, with a member's interest and responsibilities. We call that incentive management.

Through use of the incentive system the Lincoln Electric Company has more than quadrupled labor's wages over the past fifteen years; prices have been reduced at the same time by more than 60 per cent; the number of people employed has more than doubled, and the stockholders have had a progressively higher return.

TELLING THE WORKER WHERE HE STANDS

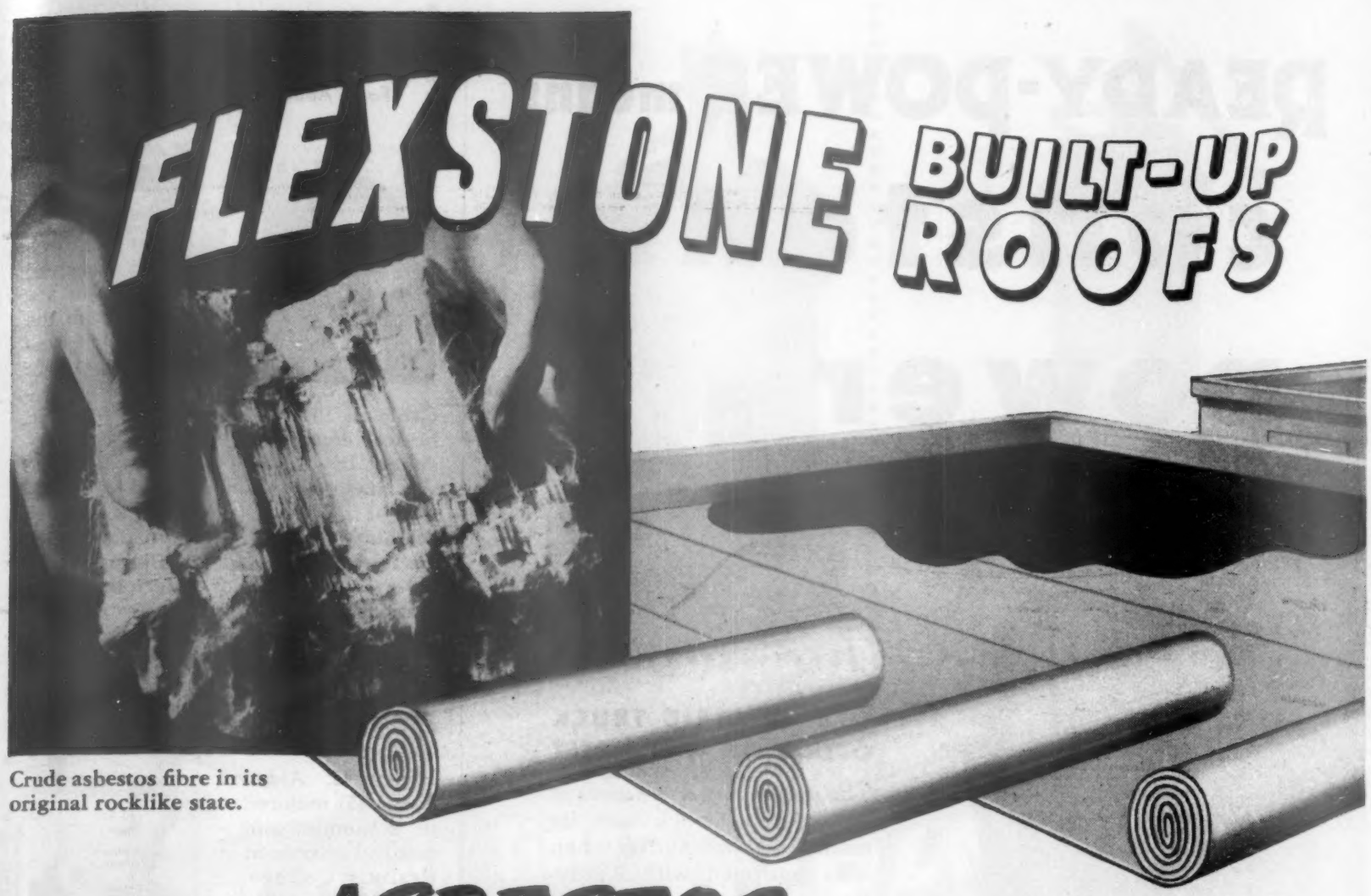
WILLIAM J. REILLY, Ph.D., Director, National Institute for Straight Thinking, speaking before American Management Association.

A worker wants to know year in and year out exactly where he stands. For this reason, every supervisor, at least once a year, should sit down with each of his workers and have a thorough heart-to-heart, man-to-man talk, so that the worker will know what kind of job he's done and what his chances for advancement are—providing he really desires to advance to the next job ahead.

Many executives and supervisors are gushy about discussing such subjects with their workers, because they assume that everyone in the organization aspires to the next job ahead.

But those who understand the inner desires of people know that this is not so. I have talked with many an office worker who has no desire to assume the responsibility of being a supervisor. Many a chief clerk is perfectly satisfied to remain a chief clerk.

What most workers want is to keep on doing what they're doing right now, but they do want to be treated as individuals, to be appreciated, to be understood. And a serious talk at least once a year with each of his workers gives the supervisor a chance to keep in touch with their real desires.



Crude asbestos fibre in its original rocklike state.

Made of ASBESTOS each ply is a flexible covering of stone

There's the secret of that Rock-of-Gibraltar resistance to wear and weather which you get in Johns-Manville Flexstone Roofs! It's in the *felts.* They're made of the magic mineral *asbestos*—fireproof, rotproof, long-lasting.

Give your buildings that kind of all-out protection.

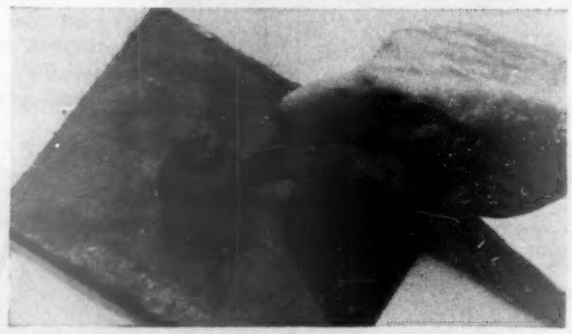
Flexstone Roofs are *smooth-surfaced*, permitting fast and thorough roof drainage, eliminating the extra weight of slag or gravel, and making it easy to locate and repair any damage. They need no periodic coating. Asbestos felts are perforated to insure smoother and better application.

All Flexstone Built-Up Roofs are engineered to the particular requirements of your building—whether it's new construction or re-roofing. To insure skilled application, they are applied only by J-M Approved Roofers.

Three types are available: Flexstone *Super "A"*, Flexstone *Standard*, and Flexstone *Service*—each the finest that can be specified for its purpose. Write for our brochure BU-51A. Johns-Manville, Box 290, New York 16, N. Y.

Because of unprecedented demand, there may be times when we cannot make immediate delivery. Please anticipate your needs.

Resist drying-out action of the sun



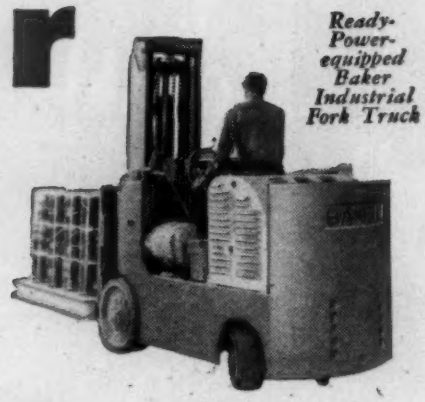
"SCRAPE TEST" proves it!

Wherever you scrape the gray surface of a Johns-Manville Flexstone Roof, you'll find black live asphalt underneath, showing that the felt itself and the waterproofing agent between the plies is effectively protected from the sun by the asbestos fibres within the felts. Result: Flexstone Roofs won't dry out . . . give extra years of service.

JOHNS-MANVILLE JM PRODUCTS

Johns-Manville FLEXSTONE BUILT-UP ROOFS

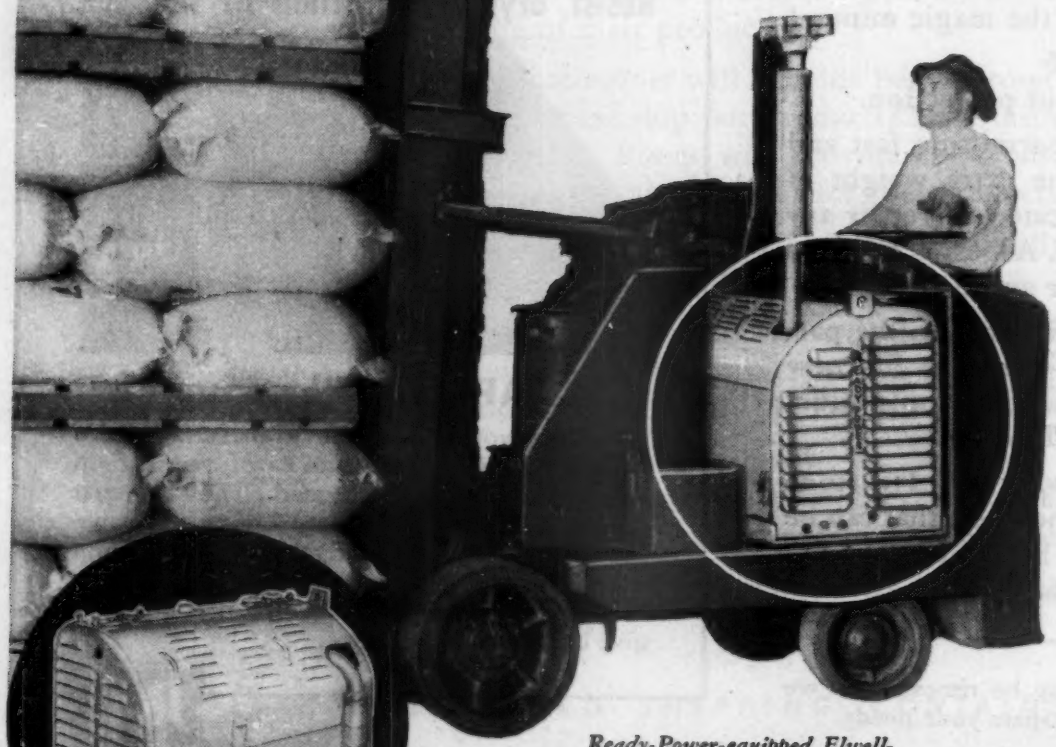
READY-POWER means constant power



Ready-Power-equipped Baker Industrial Fork Truck

FOR ELECTRIC TRUCK OPERATION AT ITS BEST

The *maximum performance* of any electric truck can be maintained *indefinitely* when it is equipped with Ready-Power. These complete, compact power units provide constant, dependable power generated right on the truck chassis. Any electric truck can be converted to Ready-Power. Manufacturers will equip trucks with Ready-Power at your request.



Ready-Power-equipped Elwell-Parker stacking merchandise

THE READY-POWER CO.

3820 Grand River Ave., Detroit 8, Michigan

BEHIND THE BYLINE

Facts About FACTORY'S Authors

Robert C. Tyo (page 78) received his degree in accounting from the University of Alabama. Until he joined Porter-Cable in 1943 as assistant comptroller, he was employed as an industrial consultant by F. A. Benedict. In 1944 Tyo was made comptroller and office manager of Porter-Cable. He was elected secretary of the corporation in 1946. He is a member of Delta Sigma Pi, and is on the board of directors of the National Cost Accountants and the Tax Executive Institute.

Henry H. Alden (page 85) majored in economics and political science at Ursinus College. From 1930 to 1940 he taught mathematics and social studies in a high school in Warren, Ohio. Alden joined American Welding in 1941 as an auditor. A year later he was placed in charge of general accounting activities. Today he is a director of the company and assistant secretary and treasurer.

Walter C. Hasselhorn (page 100) started out as machinist engineering clerk with International Harvester Company in 1919. Since then he has worked with Western Electric, Wilson and Company, and Kellogg and Company. In 1936 he accepted the position of vice president and general manager at Cook Electric. He was made president in 1939. Hasselhorn is a business administration graduate of the University of Chicago and of Armour Institute of Technology. He belongs to the Society for Advancement of Management and ASME.

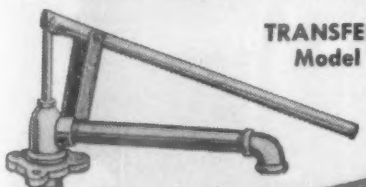
Ray Stroppel (page 107) is a member of the Engineering Society of Cincinnati and vice-chairman of the Cincinnati section of the American Institute of

ELECTRIC LUBRIGUN
High-Pressure Grease Gun. Universal Motor ¼ H. P., 110/115 volt A. C. or D. C., 30-lb. capacity.

Model 244

Model 987 POWERLUBER
Air-motor operated, High-Pressure Grease Gun. 60-lb. capacity. Truck available for easy portability.

Model 1273D PORTO-PAK
High-Pressure Grease Gun. Has automatic Pressure Release. 30-lb. capacity.



TRANSFER PUMP Model 1316

Heavy-Duty Pump — Handles heavy and viscous lubricants.

REDUCE Down Time--INCREASE Production with LINCOLN *Engineered* LUBRICATING EQUIPMENT

The finest lubricants available will not protect bearings against failure unless they are properly applied. Good lubricants applied to bearing surfaces with Lincoln High-Pressure Lubricating Equipment will assure longer bearing life, reduce down-time and increase production.

No matter what your lubrication needs may be — from grease fittings to a complete, full-automatic, centralized lubricating system, Lincoln can furnish the *Right* equipment specifically engineered to do the job. Ask your Wholesaler for information on the complete line of Lincoln Lubricating Systems, or write us direct.

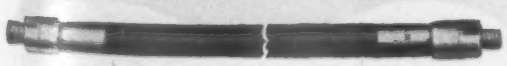
Model 1101A PUSH-TYPE GREASE GUN
One-hand operation. All steel. Capacity 9 ozs. Also available with 15 oz. capacity.

Model 1035

Heavy Duty LEVER GUN
Develops 10,000 lbs. pressure. 19 ounce capacity.

GREASE FITTINGS
Complete range of types and sizes.

HIGH PRESSURE and VOLUME HOSE



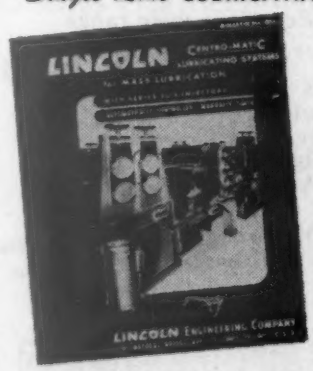
HEAVY DUTY 4" SERIES Airline* Drum Pumps

Model 1793

Model 1799

Models available with various pressure ratios to fit 400 lb. and 100 lb. size drums of either bung-opening or full-open type. Two wheel truck for 100 lb. Models.

CENTRO-MATIC *Single Line* LUBRICATING SYSTEMS



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Trade Mark LINCOLN and Trade Names Lubrigun, Powerlubar, Porto-Pak and Centro-Matic registered U. S. Pat. Office.

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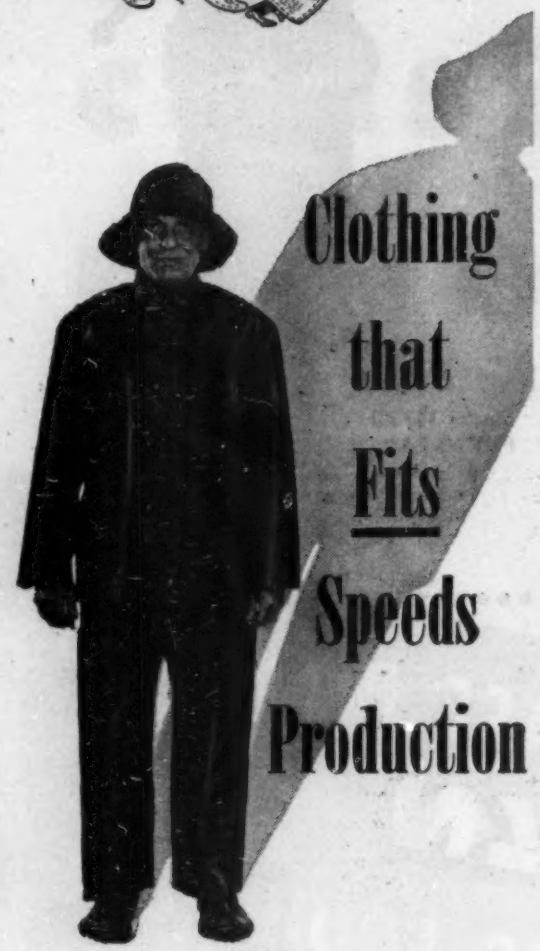
Pioneer Builders of Engineered Lubricating Equipment

LINCOLN ENGINEERING COMPANY • 5701 NATURAL BRIDGE AVE., ST. LOUIS 20, MO.

TAILORED FOR THE MAN ON THE JOB



● Men tied up in ill-fitting work clothes can't give you that UP you want in production. Royal Archer Rubberized Work Clothing is tailored to *fit*. They don't hamper and bind. They *do* help efficiency and lower accident rates.

Archer Waterproof Fabrics are coated to be resistant to alkalies, acids, oils, abrasives and most chemicals.

If we don't already make the garment you need, we'll design it for you. And we offer also a wide range of coated fabrics for many industrial uses including Archerite Plastic Films and Coatings.

Ask your Industrial Wholesaler about Royal Archer Work Clothing or write direct to Archer Rubber Co., Milford, Massachusetts. Quality Rubberized Goods Since 1907.

DUCHESS RUBBER COMPANY
ROYAL ARCHER
Rubberized
WORK CLOTHING
Quality Rubberized Goods Since 1907

BEHIND THE BYLINE *(continued)*

Electrical Engineers. He's also a member of the AIEE's national committee on machine tools, material processing, and fabrication. Stroppel has been plant engineer at Tool Steel since 1929. He attended the University of Cincinnati and an electrical trade school. Teaching and lecturing on electrical hazards occupy much time. His hobby is a labor of love for the Kiwanis Club (he's local president) and the Boy Scouts.

Willis F. Tiemann (page 108) traveled extensively through the Americas after 1916 for the Fulton Iron Works as a field service engineer. In 1930 he became superintendent of the Springfield branch of that company. Three years later Tiemann became affiliated with The National Supply Company, and twelve years after joining the company became works manager of the Superior Engine Division. During that period he worked as foreman, superintendent of assembly, plant superintendent, and assistant works engineer.

Thomas J. Cain, Jr., (page 114) is a graduate of Pennsylvania State College and a former supervisor of safety for the Cleveland Graphite Bronze Company. During the war he was a field representative for the industrial safety and health section of the U. S. Department of Labor. In January, 1946, Cain joined the B. F. Goodrich Company to head a greatly expanded safety department. He holds membership in the American Society of Safety Engineers, and it is claimed by friends that even his hobby is selling accident prevention.

Arthur G. Newton (page 118) has never held any position in the Rockbestos Products Corporation but that of its president. He has been that since 1923. After attending Yale University, he worked for the Johns-Pratt Company and was general manager of the Fletcher Works, Philadelphia. During the first World War, he served as a major in the

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- ✓ **Wide Adaptability** —sizes ½ to 75 h. p.
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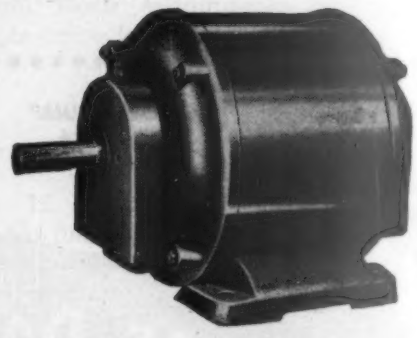

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Present tangible recognition to employees through Robbins real karat gold awards. Nothing replaces gold in value: nothing replaces employee recognition for increased production, improved labor-management relations, and greater worker interest. Sketches and designs submitted without obligation.

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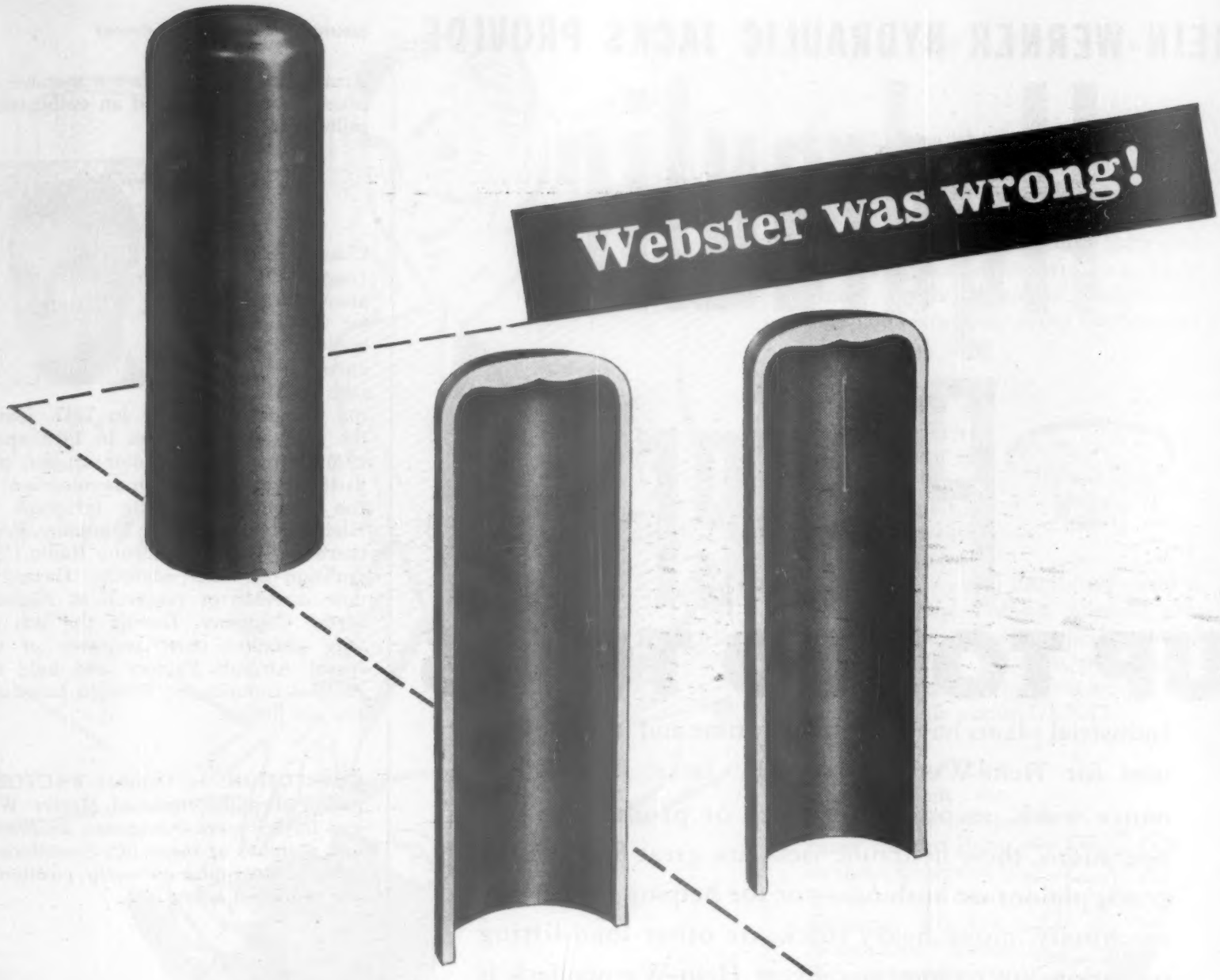

WEBSTER defined tubing as "a length or piece of tube . . . a hollow cylinder for conveying fluids, etc." But several smart production executives can provide a much better definition of tubing: "A time-saving, cost-cutting aid to more efficient production."

Of course, they're referring to OSTUCO seamless and electric-weld steel tubing, fabricated to the most intricate specifications by skilled OSTUCO craftsmen.

Spinning, the process illustrated, is just one of the many forming and fabricating operations OSTUCO is prepared to perform for you. This one process alone has cut production time and costs on such divergent products as dentist's drills and refrigerator compressors . . . it may be the solution to *your* production problem. An OSTUCO sales engineer will gladly show you how and why.

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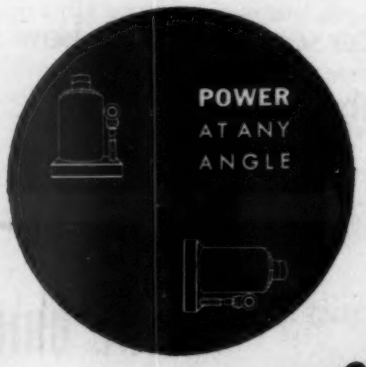

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HYDRAULIC JACKS

HEIN-WERNER CORPORATION • Waukesha, Wis.

BEHIND THE BYLINE *(continued)*

Army Air Services. He's a member of several social clubs and an enthusiastic sailing fan.

Charles S. Hazard (page 120) holds about 30 patents for developments made during his career. He designed airplanes for Standard Aircraft in 1917, joined the Navy as an ensign in 1918, spent 1920 selling White motor trucks, and in 1923 was working on development of the automatic printing telegraph at Klein-Schmidt Electric Company. From there he went with Bruno Radio Corporation as chief engineer. Hazard is now director of research at Neptune Meter Company. During the war he was assistant chief engineer of the Naval Aircraft Factory and held the rank of commander. Foreign languages are his hobby.

CORRECTION: *In October* FACTORY, *page 260, photographs of Messrs. Wilk and Bajork were transposed. Biographical sketches of these two contributors, with photographs correctly positioned, are reprinted below. Ed.*

R. V. Wilk (page 105), works manager for Day-Brite Lighting, Inc., started work at the age of seventeen. Before joining Day-Brite in 1941, he was plant manager for the Ford Roofing Products Company, Vandalia, Ill. At Day-Brite he has initiated many labor-saving processes to speed production and improve quality. In his spare time he concentrates on handball and fishing.

Leonard C. Bajork (page 129) first became interested in labor relations while employed by the Thompson-Starret Company in 1920. Since that time he has worked with the NRA staff, and has been director of both the Chicago and St. Louis offices of the National Labor Relations Board. For some time he had his own consulting business, specializing in labor relations. He has handled more than 3500 labor dispute settlements during his career. Since 1941 he has been personnel director of The Visking Corporation.

When it carries the GE Name

Yes, sir, that switch is a beauty from the outside, but just take a look at the inside! There's the kind of beauty that means an electrician doesn't have to be a contortionist to install it — the kind of beauty that means years of users' satisfaction. Those are the things you expect — and get — in wiring devices that carry the General Electric name.

One glance at this good-looking switch and the mention of General Electric, and you'll go for it. But, see for yourself that there's nothing half-way about the inside construction. Extra-heavy contacts and springs and large binding screws provide durability, and make installation easy. Look at the heavy, two-inch deep Textolite* box, and the handy, break-away plaster ears. Available in single-pole, double-pole, three-way, and four-way construction, too. Its number is GE2923. Its name is General Electric — the name that gives you confidence in your choice of wiring devices.

Ask your distributor about the GE2923 and the rest of the work-saving line of General Electric wiring devices. **Trade-mark Reg. U. S. Pat. Off.*

WIRING DEVICES by

GENERAL ELECTRIC

Wiring Briefs from your G-E Distributors

Do you know the interesting features that help make General Electric wiring devices easy to use and safe to specify? Do you know the wide variety of items in this full line? For useful facts and interesting bits of information, keep posted on this column. It's designed to help you learn more about the General Electric line.

Looking for a quality lampholder that is strong and light in weight? GE3017 meets both requirements—quality and durability— and it makes a good-looking, finished job. Large, white plastic receptacle covers unsightly gaps in walls or ceilings, gives the kind of long-term service you want. Ask us about GE3017.

Remember the stories about the *little man* who turns off the light in the refrigerator? The one about General Electric Watch Dog* fluorescent starters is even better, because it's true. Here's part of the story: a Watch Dog starts a lamp just like any other high-quality starter. But, once it's in operation, it stands guard, watching for any indication of lamp flicker. When a lamp begins to flicker, the Watch Dog starter turns it out — saves circuits and ballasts, outlasts other starters 5 to 1. There are many other useful features we'll be glad to tell you about.

Surface wiring used to be the ugly stepchild, but you'd be surprised at how neat and good-looking it's grown. You'll appreciate how handy it is for wiring shops, warehouses, garages, or temporary construction. There is a good variety of outlets, lampholders, and switches — all easy to install, quick to wire. Convince yourself with General Electric's new folder on surface wiring devices. For your free copy, write to Section D75-1234 General Electric Company, Bridgeport 2, Connecticut.

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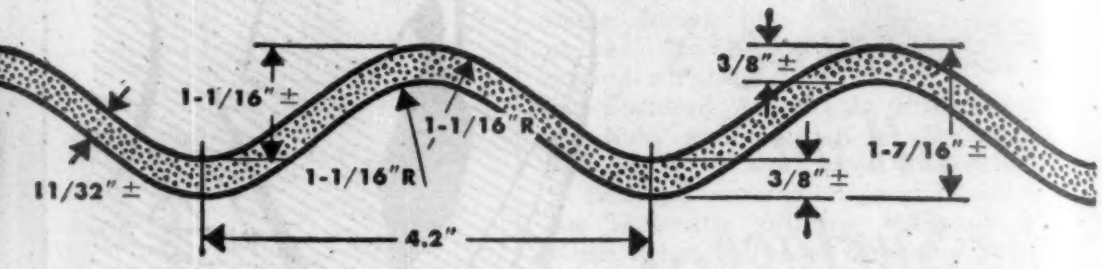

Carey stone available now in 4.2" corrugation

Famous **CAREYSTONE** Corrugated Asbestos-Cement Roofing and Siding, in the 2⅝" corrugation, has been a favorite for over 20 years on factories, foundries, warehouses and other industrial buildings. Now new **CAREY** production facilities make easy-to-put-up **CAREYSTONE** available in 4.2" corrugation for an even wider range of low-cost, fast construction uses.

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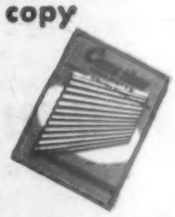
CAREYSTONE is such an ideal material for so many different applications that you'll want to . . .

Write for your free copy



. . . of this information-packed booklet, Careystone Manual 808. It's full of technical information on using **CAREYSTONE** in construction . . . tells the full story of the estimating and engineering service right down to detailed recommendations (including sketches) on many varied applications. In requesting your **FREE** copy, address Dept. F-12.

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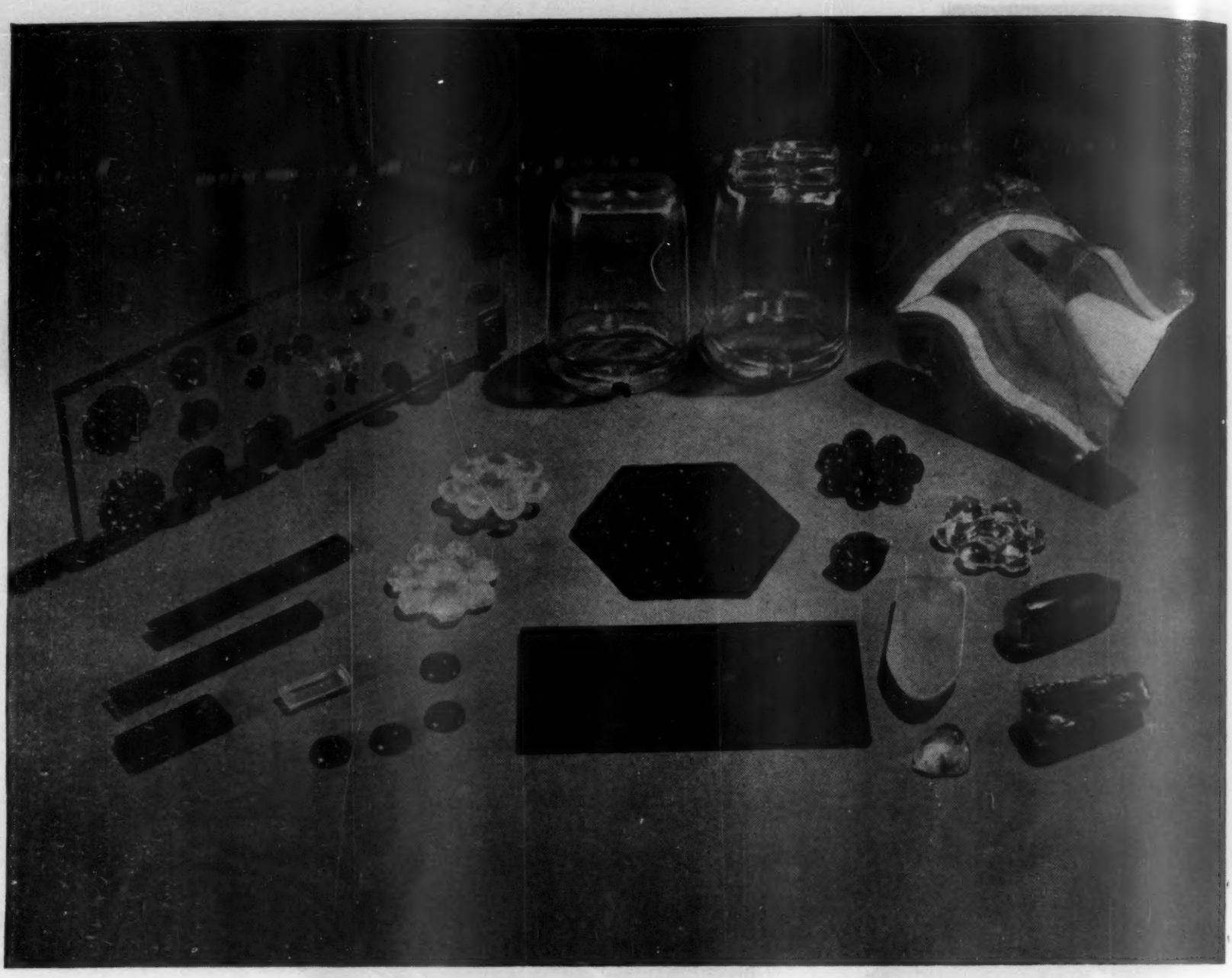

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Reliance Protected, Open Type A-c. Motor.

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RELIANCE *Precision-Built* MOTORS

1. **Protecting enclosures** keep out dirt, chips, oil, excess moisture.
2. **Steel stators for strength.**
3. **Thirteen-step winding treatment,** for maximum stator protection.
4. **Pressure cast aluminum rotors** provide trouble-free windings.
5. **Heavy shafts,** liberally designed for added strength.
6. **Improved bearing lubrication** affords *real* protection to bearings and windings.
7. **Optional lead outlet arrangement** permits machine mounting with elimination of conduit box.
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● Reliance *Precision-Built* Motors are designed *to make it absolutely impossible to grease them wrong.* On the vast majority of applications, these factory lubricated motors continue to operate *for years* with no additional lubrication whatsoever. In cases where unusual conditions make occasional attention necessary—or if it is your practice to lubricate at regular intervals—undergreasing or overgreasing make no difference. Write for Bulletin C-118 which tells how Reliance *Precision-Built* Motors bring an end to lubrication worries.

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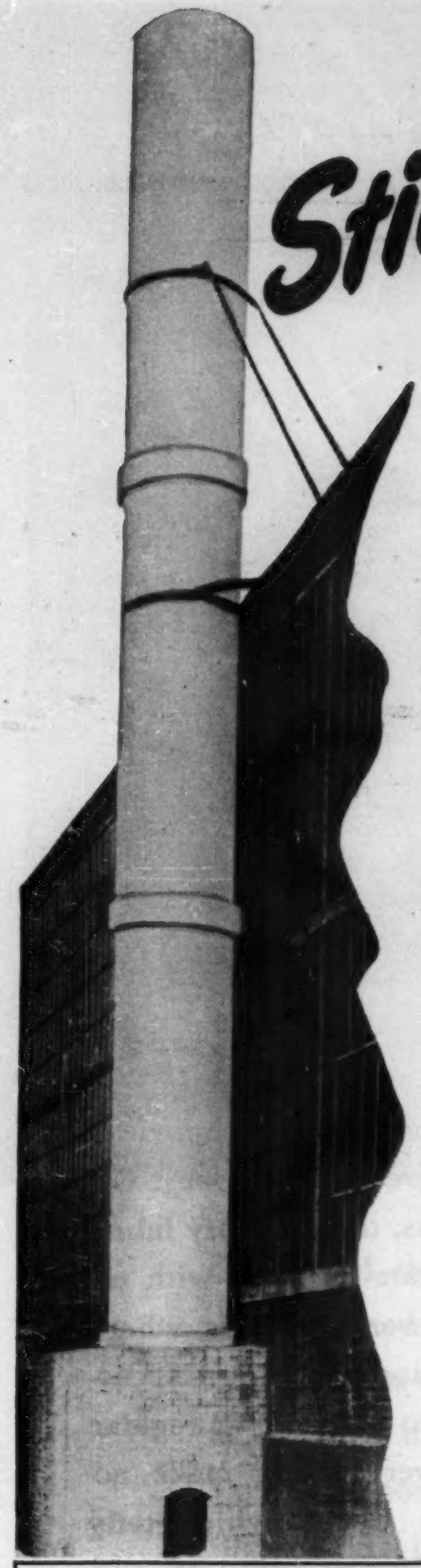

Still on the Job

AFTER MORE THAN 15 YEARS FIGHTING 2-WAY CORROSION

HERE IS ANOTHER EXAMPLE of the type of venting service provided by Transite Industrial Vent Pipe.

For more than 15 years, this Transite stack at the Waterbury, Connecticut, plant of the Chase Brass and Copper Company has been exposed to conditions so severe that the pipe previously used had to be replaced at frequent intervals. Its interior is constantly subjected to the destructive action of corrosive acid fumes . . . its exterior to the aggressive attacks of weather. Yet despite this double-barreled attack from corrosion, it has required but very little maintenance *and is still on the job today.*

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Typical industries in which Transite Industrial Vent Pipe is used

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Bleaching	Explosive	Laundry	Quarrying	Soap
Boiler Works	Farm Machinery	Leather	Railroad	Soft Drink
Brewing	Food	Meat Packing	Rayon	Sugar Refining
Canning	Foundry	Metal	Refrigeration	Textile
Ceramic	Furnace	Mining	Rubber	Tool
Chemical	Furniture	Paint	Sewage Works	Water Works

Johns-Manville TRANSITE Industrial Vent PIPE

BOOKS

PERSONNEL ADMINISTRATION

PAUL PIGORS and **CHARLES A. MYERS**, Associate Professors of Industrial Relations, Industrial Relations Section, Department of Economics and Social Science, Massachusetts Institute of Technology. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 553 pages. Case studies, list of selected references, index of names, subject index. $4.50.

Subtitled "A Point of View and a Method," book stresses the philosophy of personnel administration and demonstrates the value of principles that are realistically formulated, thoroughly explained, and consistently applied. Part I consists of the following chapters: The Nature of Personnel Administration; Handling Personnel Problems; Diagnosing Organizational Stability; Building and Maintaining Work Teams; Wages and Hours; Employee Services and Programs. Part II is devoted to case studies.

LABOR RELATIONS AND HUMAN RELATIONS

BENJAMIN M. SELEKMAN, Kirstein Professor of Labor Relations, Graduate School of Business Administration, Harvard University. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 253 pages. Index. $3.

Examines the course of influence upon the network of relationships established when a union enters a workplace, explores the content of collective bargaining as a social process involving human people, and suggests beginnings in approach and action that seem worthy of further test in improving joint relationships among such people. Three parts: Transition in Labor Relations: A Social Change; Administering the Agreement; Leadership and the Road Ahead.

PURCHASING

STUART F. HEINRITZ, Editor, "Purchasing Magazine." Prentice-Hall, Inc., 70 Fifth Ave., New York 11. 671 pages. Forms, graphs, tables, index. $5.35.

The science of purchasing is discussed from the functional approach, pointing out how the purchasing agent can attain proficiency in fulfilling his responsibility for procuring the right materials, in the right quantity, at the right time, from the right source, at the right price. In five parts: Organization for Purchasing; Purchasing Principles; Purchasing Procedure; Tools of Purchasing; Purchasing Policies.

PRACTICAL ELECTRICAL WIRING

H. P. RICHTER, Member, International Association of Electrical Inspectors, American Society of Agricultural Engineers. McGraw-Hill Book Co., 330 West 42nd St., New York 18. 574 pages. Photographs, diagrams, drawings, tables, index. $3.75.

Third edition. Based on the 1947 National Electrical Code, practical methods of electrical wiring are explained for the man who does the work. Tells how

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That's the beauty — and *economy* — of handling materials "thru-the-air." There's no waste effort, no delay, no loss of valued floor space. Best of all, "thru-the-air" handling lends itself to many different operations, even to carrying the load from the raw material stage right on through to the finished product!

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- Shaved gears for lifetime service . . . all bearings grease-sealed.
- Motors specifically designed and built by P&H for hoist service — high starting torque, frequent reversal, etc.
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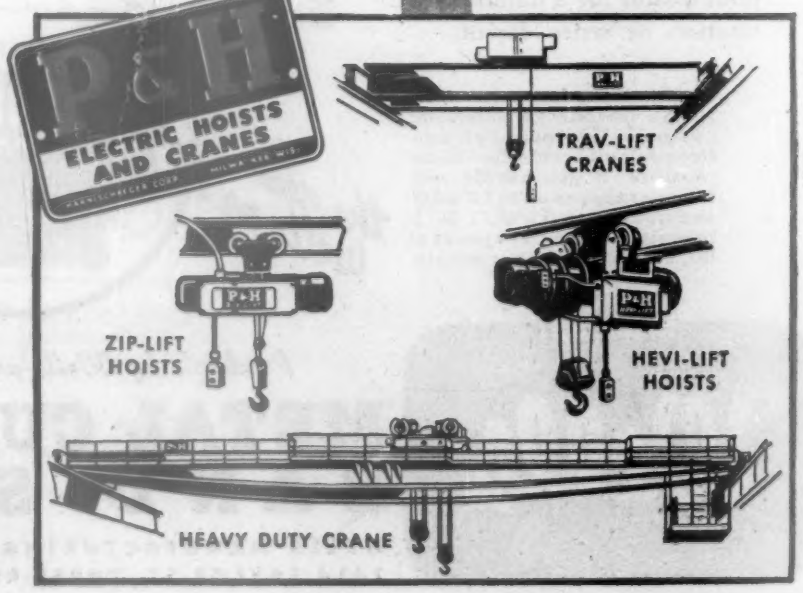

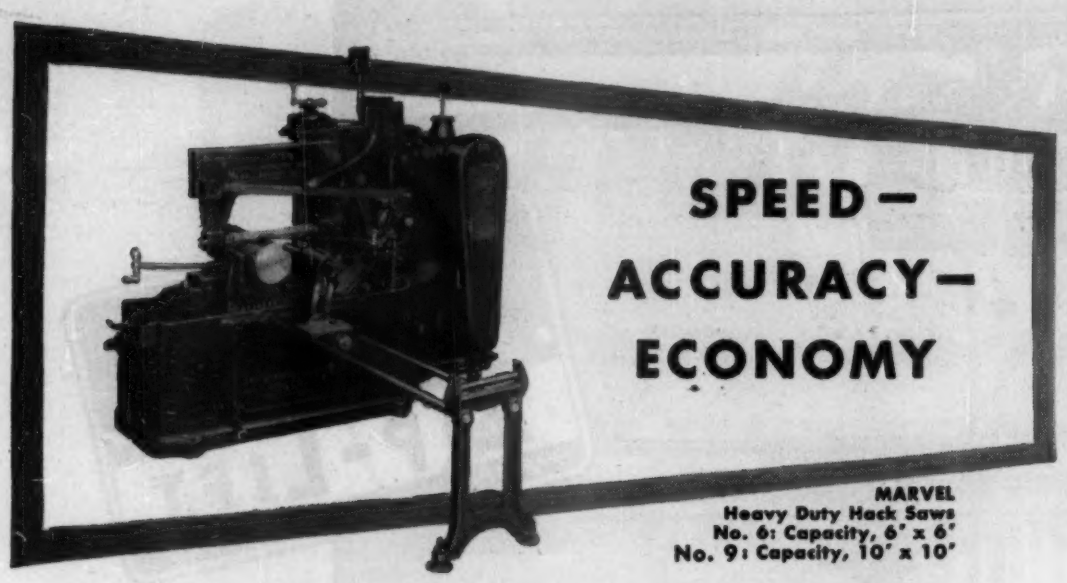

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No. 6: Capacity, 6" x 6"
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The MARVEL No. 6 and No. 9 Heavy Duty Saws are ideal for production cut-off work where highest speed, greatest accuracy and true economy are essential.

These saws have proven, in hundreds of plants, that they have the stamina to stand heavy duty operation "around-the-clock." They are faster because of the quick return of the saw frame on the non-cutting stroke. They are more accurate because they are fully ball bearing, and they are economical because they get more work from a high speed blade. (Also available with automatic stock push up feed).

There are many more outstanding features described in our catalog. If you want the best in a hack saw—see what MARVEL has to offer.

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WHEN YOU CUT WITH A . . . WELLS
METAL CUTTING BAND SAW

You'll get the job done faster with a Wells Band Saw because the cutting action is continuous. There is no wasted motion. Service records in hundreds of leading plants prove that Wells Saws reduce cutting time, yet they are versatile and economical. Ask your dealer for a demonstration or write direct.

The revolutionary new Wells No. 12 features an automatic hydraulically controlled cutting cycle and controlled blade pressure. It will handle rectangular shapes up to 12"x16" and rounds to 12¾" O. D. It operates at selective speeds of 60, 90 and 150 ft. per minute.

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to do all kinds of light and power wiring jobs, and presents fundamentals, terminology, basic principles, theory behind practices, and practical wiring instructions.

COMPRESSED AIR HANDBOOK

COMPRESSED AIR AND GAS INSTITUTE, 90 West St,, New York 6. 387 pages. Photographs, sketches, charts, figures, formulas, tables, index. $3 in U.S.A.; $3.50 elsewhere.

Subtitled "Applications, Equipment, Engineering Data, and Test Procedure," this handbook discusses the many uses of compressed air, and presents information regarding proper installation, use, and maintenance of air compressors and other air-actuated equipment. It is divided into 5 chapters: "Typical Applications of Compresed Air and Gas," "Representative Types of Compressor Installations," "Portable Air-Operated Tools and Rock Drills," "Engineering the Compressor Installation for Maximum Efficiency," and "Compressed Air Engineering Data and Test Procedure."

BOOKLETS

MATERIALS FOR SAFETY WEARING APPAREL. Commercial Standard CS129-47. U. S. Department of Commerce. 13 pages. Supt. of Documents, U. S. Government Printing Office, Washington 25, D. C. 5¢

TUBE FITTERS' MANUAL. Handbook No. 111. The Parker Appliance Co., Cleveland 12. 76 pages. Photographs, diagrams, drawings. $1.

COMPULSORY ARBITRATION: OPPOSED. The Case Against Adoption. Department of Manufacture, Chamber of Commerce of the United States, Washington 6, D. C. 28 pages. No charge.

STREAMLINING OFFICE METHODS. Homer Smith, Training Supervisor, Terminal Island Naval Shipyard, San Pedro, Calif. 26 pages, Charts, drawings. No charge.

CENSUS PUBLICATIONS, JANUARY-MARCH, 1947. Catalog and Subject Guide. Bureau of the Census, Department of Commerce. 109 pages. U. S. Government Printing Office, Washington 25, D. C. No charge.

ON THE CALENDAR

DECEMBER

15-16, American Management Association, Production Conference, Hotel Pennsylvania, New York. James O. Rice, Manager, 330 West 42nd St., New York 18.

JANUARY

12-16, The Society of Automotive Engineers, Inc., Annual Meeting, Book-Cadillac Hotel, Detroit. John A. C.

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better construction–faster construction

Simply interlock the large-area steel sections—and there you are, with a smooth, steel surface ready for concrete, mastic and wood or linoleum, or other floor surface of your choice. It's a sturdy floor, suitable for buildings of almost any description.

HIGH STRENGTH-WEIGHT RATIO. Achieved by the inherent strength of the cellular structure. Considerable weight is saved in the complete floor unit.

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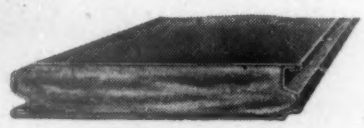

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26-29, Refrigeration Equipment Manufacturers Association, 5th All-Industry Refrigeration and Air Conditioning Exposition, Cleveland Public Auditorium. F. J. Hood, Chairman, Room 1107, Clark Bldg., Pittsburgh 22.

26-30, American Institute of Electrical Engineers, Winter General Meeting, William Penn Hotel, Pittsburgh. H. H. Henline, Secretary, 33 West 39th St., New York 18.

FEBRUARY

2-6, American Society of Heating and Ventilating Engineers, 54th Annual Meeting, concurrently with 8th International Heating and Ventilating Exposition, Grand Central Palace, New York. A. V. Hutchinson, Secretary, 51 Madison Ave., New York 10.

15-19, American Institute of Mining Engineers, Annual Meeting, Hotel Pennsylvania, New York. H. N. Appleton, Convention Manager, 29 West 39th St., New York.

16-18, American Management Association, Personnel Conference, Palmer House, Chicago. James O. Rice, Manager, 330 West 42nd St., New York 18.

MARCH

1-5, American Society for Testing Materials, Spring Meeting, Hotel Statler, Washington, D. C. Robert J. Painter, Assistant Secretary, 1916 Race St., Philadelphia 3.

1-6, American Society of Mechanical Engineers, Spring Meeting, St. Charles Hotel, New Orleans. Ernest Hartford, Executive Assistant Secretary, 29 West 39th St., New York.

4-5, The Society for the Advancement of Management, Inc., Spring Conference on Management Controls, Continental Hotel, Chicago. Carl S. Coler, Executive Director, 84 William St., New York 7.

14-19, National Electrical Manufacturers Association, Spring Meeting, Edgewater Beach Hotel, Chicago. R. J. Blais, Convention Manager, 155 East 44th St., New York.

15-19, American Society of Tool Engineers, 16th Annual Meeting, in conjunction with the Tool Engineers Industrial Exposition, Public Auditorium, Cleveland. Harry E. Conrad, Executive Secretary, 1666 Penobscot Bldg., Detroit 26.

22-24, Chicago Technical Societies Council, Inc., Production Show and Technical Conference, Stevens Hotel, Chicago. Lewis M. Glassner, Public Relations Counsel, 53 West Jackson Blvd., Chicago 4.

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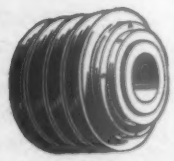

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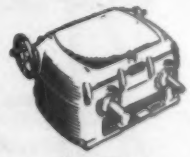

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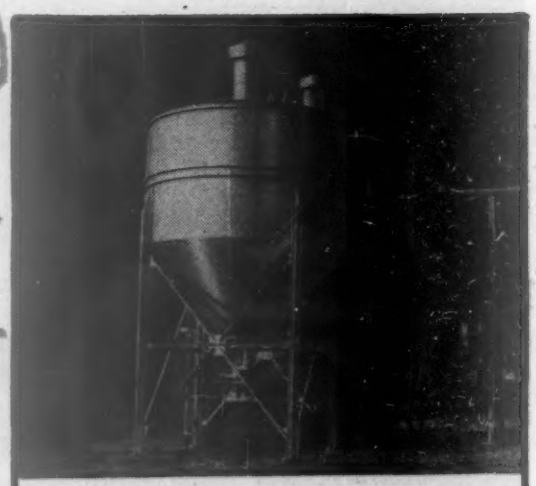

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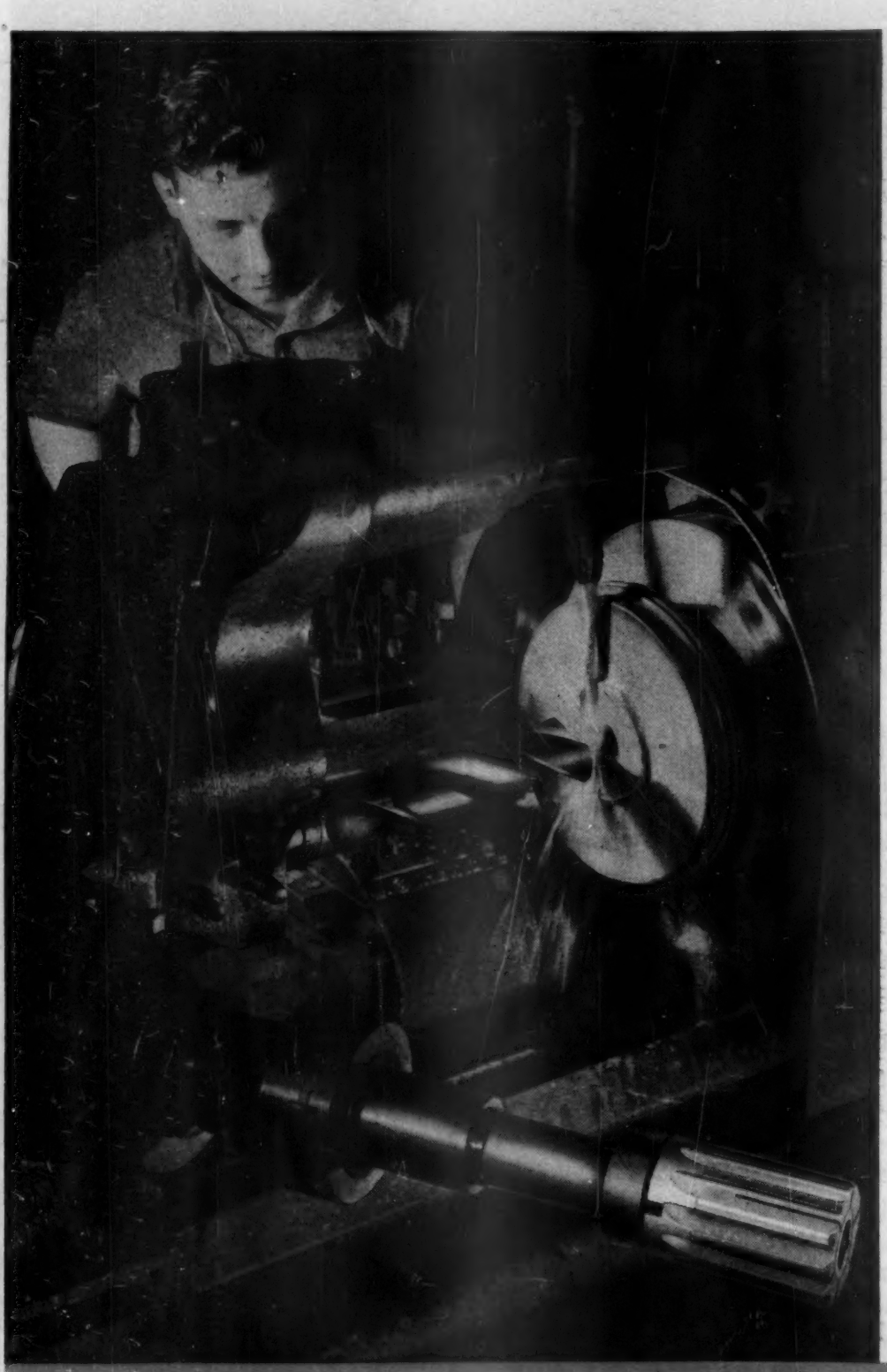

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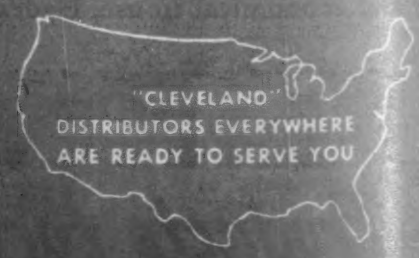

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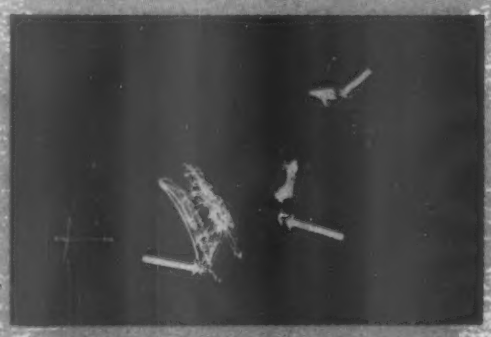

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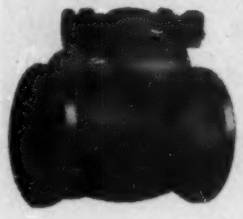

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AFTERCOOLERS—for air-power lines, and for gas-distribution systems, are treated in 16-page Form 3014-B. Sectional views illustrate structures, and typical set-up is shown. Selection table is included. Ingersoll-Rand Co.

2

AIR DIFFUSERS — Bulletin K-20, 32 pages, contains engineering data on Kno-Draft adjustable ceiling air diffusers. Consists of construction, operation, and installation details, as well as selection and performance information. W. B. Connor Engineering Corp.

3

BULK MATERIALS HANDLING—with Pneu-Vac, for conveying bulk materials from boxcar to storage bins, or from one processing stage to another, vertically or horizontally, is the subject of 4-page Bulletin PV-546. Drawings show different arrangements and features are outlined. Sprout-Waldron & Co.

4

BUSINESS MACHINES—for accounting and collating; and for time recording, indicating, and controlling are pictured and described in booklet. International Business Machines Corp.

5

CENTRIFUGAL PUMPS — Single-stage, enclosed impeller-type "Close-Cupld" centrifugal pumps are treated in 12-page Bulletin 710-1. Construction materials are outlined, and specification, performance, and dimension data are provided. Goulds Pumps, Inc.

6

CHAIR—of welded tubular steel, with cushion seat, is set forth in 6-page folder. Covers features, types, sizes, and construction. Royal Metal Mfg. Co.

7

COLOR PLAN—designed for employees' eye comfort, is presented in 8-page publication. Color photograph demonstrates use of different colors for walls, floors, and machinery. Also introduces Por-Lox, a protective treatment for concrete and masonry; and ParaTex, a rubber-base coating for metals, or concrete or wood floors. Other maintenance items are outlined. Truscon Laboratories, Inc.

8

CONCRETE AND MASONRY CONSTRUCTION—Four-page pamphlet, entitled "Fight Water," describes a concrete densifier and retarder called Plastiment, an integral for concrete and mortar, an integral for cement coats, and a coating for porous masonry. Also covers a hardener for surface impregnations, a black protective coating, an expansion joint sealer, caulking compound and other maintenance products. Sika Chemical Corp.

9

CONTROL PANEL—featuring multiple controlled outlets from a single receptacle, is pictured and described in broadside. Details specifications and uses. Ewart, Healy & Koch, Inc.

10

CONVEYOR SYSTEMS—Bulletin 847, 8 pages, deals with overhead conveyors, gravity roller models, slat conveyors, apron, belt and other types. A "mile-long" overhead chain conveyor installation is shown. Allied Steel & Conveyors, Inc.

11

CONVEYORS—Roller and slide bed types of a light-duty belt conveyor table and overhead empty carton conveyor are featured in 4-page Bulletin P-A5-1A-1. Contains charts, diagrams, installations. Island Equipment Corp.

12

CONVEYORS — Port-A-Flow portable

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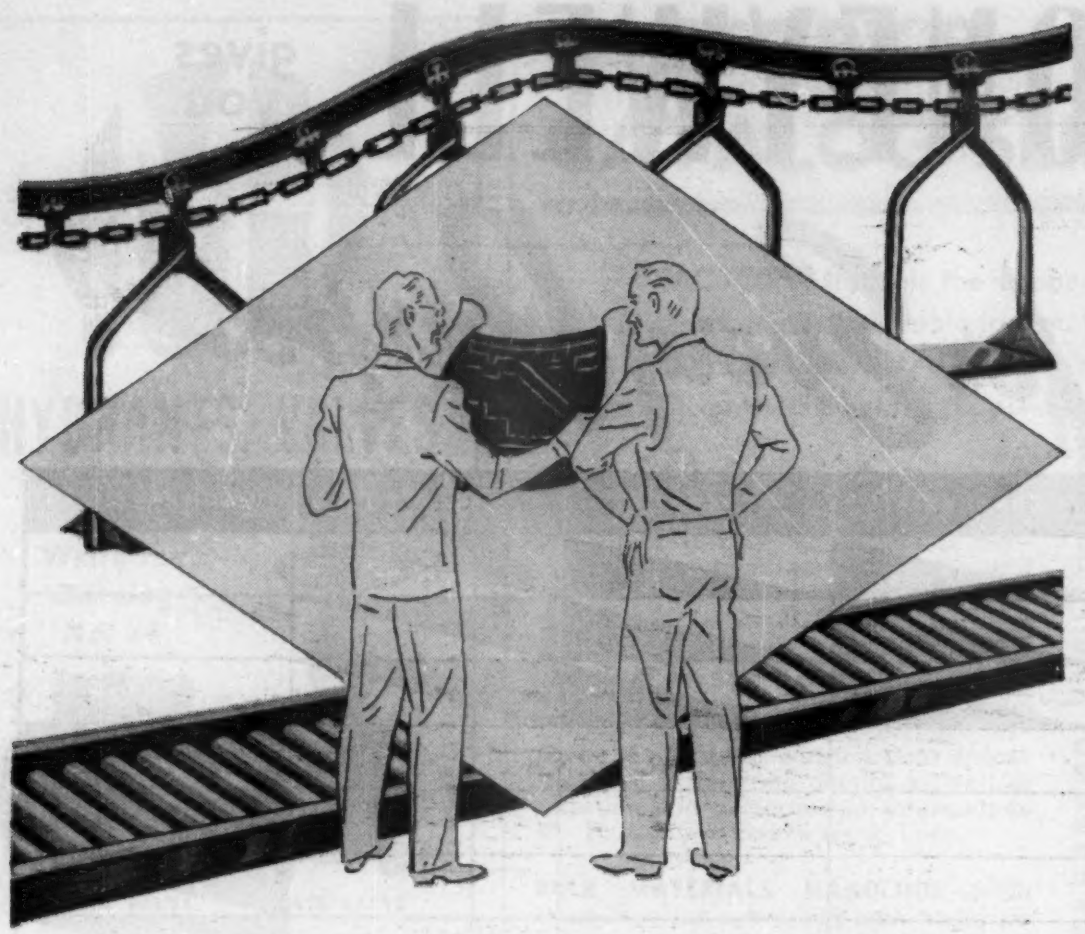

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conveyors, built in sections and mounted on adjustable, movable supports, are featured in 4-page brochure. Pictures demonstrate uses, and descriptions of construction are furnished. The Alvey-Ferguson Co.

13

COUPLING — Illustrated Form 1001 is devoted to a two-way shut-off coupling for hydraulic and pneumatic lines. Sketches demonstrate internal action on connecting and disconnecting the coupling, and specifications are given. The Hansen Mfg. Co.

14

COUPLINGS — flexible type, for power transmission applications, are introduced in 4-page Bulletin 200-C. Lists features, specifications, and ratings, and includes charts and cutaway view. Lord Mfg. Co.

15

DIFFUSION PUMPS — for moving gases and vapors, are treated in 4-page folder. Engineering data on seven types are set forth. Includes dimensional diagrams, charts, photograph. Vacuum Eng. Div., National Research Corp.

16

DUST AND FUME ELIMINATOR — swirl type, known as Centri-Merge, for grinding, buffing, burring, and polishing operations, welding-flux dust, metallic dust, and the removal of acid fumes, is treated in 12-page manual. Sectional views show principles of design and operation, and schematic diagrams are provided. Schmieg Industries, Inc.

17

ELECTRIC FITTINGS—including conduit, EMT, entrance, cable, and ground fittings, and connectors are cataloged in 62-page Bulletin 48. Lists sizes, weights, quantities, prices. Gedney Electric Co.

18

ELECTRONIC EQUIPMENT — including an automatic positioner, proof-reader, remote control devices, production controls, photo-electric inspectors, counters, switches, relays, and recorders, and other devices are outlined in 4-page text. Sketches show principles of design and applications are explained. John T. O'Connor & Co.

19

FILM SERVICE — "Facts for Your Film Folder" is the title of booklet outlining an information and supervisory service on motion pictures and slide-films for employee training and public relations. Film Counselors.

20

FITTINGS — Fabrication of light wall stainless steel welding fittings is explained in 4-page folder. Contains photographs of elbows, return bends, tees, caps, reducers, and stub ends, and lists sizes. John B. Astell & Co., Inc.

21

FITTINGS, VALVES, AND TUBING—Line of 50 nickel alloy and stainless steel sanitary fittings, valves, and tubing is set forth in 4-page Bulletin SE-1. Includes descriptions, code numbers, sizes, and sketches. Equipment Div., Filter Paper Co.

22

FLOAT SWITCH—Bulletin L3 deals with 2-pole, double-break, snap-action float switch Type L200, and packaged float switch Model LP200, for sump or tank operation. Discusses features, application, and construction. Contains operating data and dimension diagrams. Automatic Control Co.

23

FORK LIFT TRUCKS AND TRACTORS — Specification Portfolio features illustrations, engineering drawings, techni-

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ROUSTABOUT CRANES

. . . offer you safety, speed and low costs not possible with out-of-date man-handling methods

● Avoid strains and injuries and the dangers and high costs of a cluttered disorganized yard by modernizing your outdoor materials handling with these rugged mobile Roustabouts. Flexible performance—fast action with hook or magnet, loads to 7½ tons—built for years of overwork, as hundreds of users can tell you. Write for the money-saving facts . . . *today!*

Photo courtesy The A. B. Farquhar Company York, Pa.

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ROUSTABOUT CRANE

Roustabout Cranes
By Hughes-Keenan

Load-Handling Specialists Since 1904

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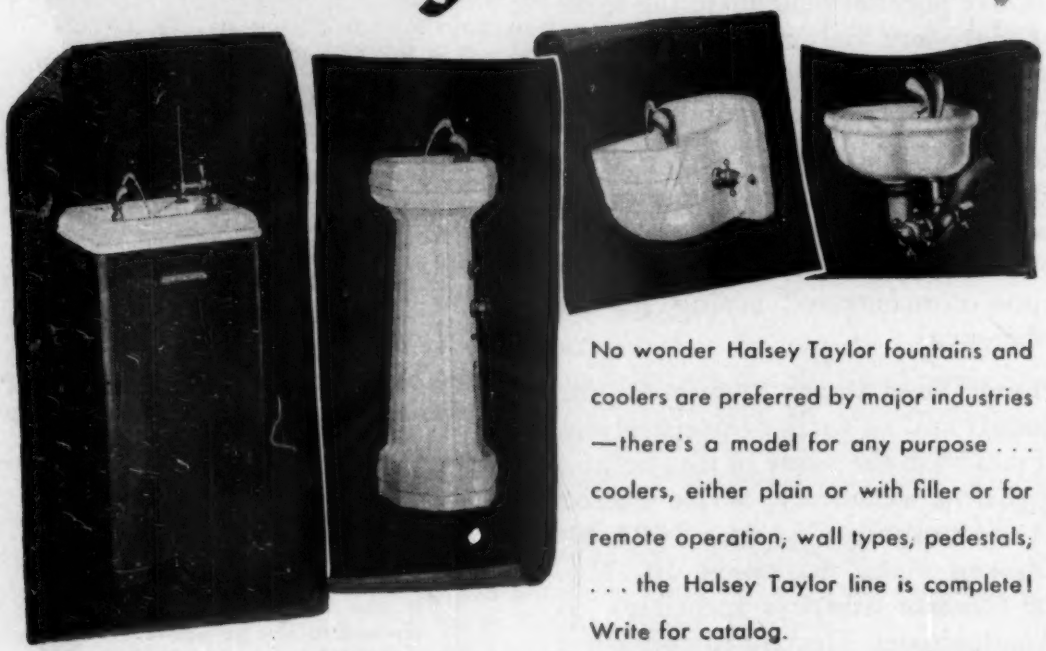
*There's a type to suit your needs!



No wonder Halsey Taylor fountains and coolers are preferred by major industries—there's a model for any purpose . . . coolers, either plain or with filler or for remote operation; wall types, pedestals; . . . the Halsey Taylor line is complete! Write for catalog.

Halsey-Taylor COOLERS and FOUNTAINS

THE HALSEY W. TAYLOR CO. · · WARREN, OHIO

F-6

cal details, and operating data on fork lift trucks and industrial tractors. Different materials-handling operations are pictured, and 4-page folder insert contains condensed specifications on the various models, in addition to individual specification sheets. Towmotor Corp.

24

FUSES—"Excessive heating of Fuses in Enclosed Switches, Panelboards, and Cabinets" is the title of 8-page report. Describes causes and remedy, with examples. Frank Adam Electric Co.

25

GRINDING — 25(a) An explanation of the centerless belt grinding method is presented in 4-page Form 656 describing a wet-or-dry belt grinder. **25(b)** Type C-6 belt grinder for contoured and straight-faced grinding is the subject of 8-page Bulletin 660. The booklets contain photographs and specifications. Porter-Cable Machine Co.

26

GRINDING WHEELS—Vitrified, silicate, resinoid, shellac, and rubber-bonded grinding wheels, disks, segments, and mounted wheels and points are covered in 6-page folder. Lists diameters, thicknesses, quantities and prices. Bay State Abrasive Products Co.

27

HARDNESS TESTER — Twelve-page booklet contains information on a portable, lightweight hardness tester reading directly in the Rockwell hardness scales. Includes conversion chart, specifications, and photographs show how it is used. Ames Precision Machine Works.

28

HEATERS — 28(a) Eight-page Bulletin 320 deals with horizontal unit heaters for heat transfer on steam and hot water installations. **28(b)** Blower-type unit heaters are presented in 8-page Bulletin 340. **28(c)** Bulletin 756, 8 pages, is devoted to down-flow unit heaters which are suspended near the ceiling. The booklets contain engineering data descriptions, and pictures. McQuay, Inc.

29

HEATING EQUIPMENT—A 32-page booklet, named "Heat for Metals," describes heat-treating methods and equipment. Includes data on standard industrial furnaces and burner systems. Installations are pictured. Surface Combustion Corp.

30

HOSE — Condor Homo-Flex gas-oil-proof creamery and packers hose is the subject of Bulletin 6893. Describes structures and applications. Manhattan Rubber Div., Raybestos-Manhattan.

31

HYDRAULIC CLAMP UNIT—called Rapidraulic Junior, for actuating lathe chucks, clamp cylinders for fixtures, and other applications, is the subject of Bulletin 305-U. Contains descriptions, specifications, installation data, schematic diagrams, operating instructions, and prices. John S. Barnes Corp.

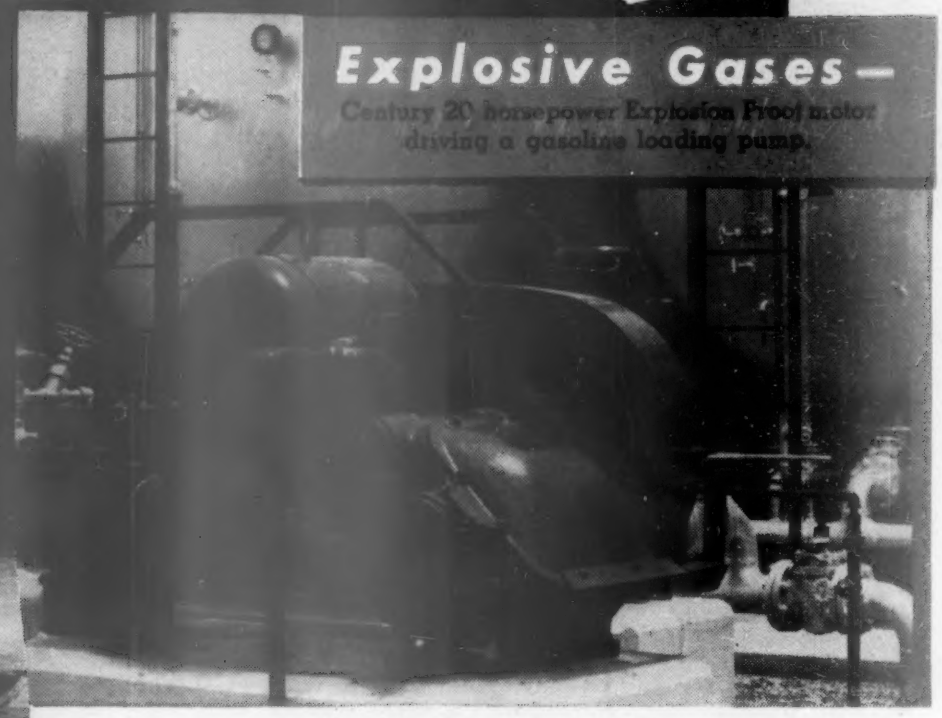
32

HYDRAULIC POWER UNITS — including pumps, valves, intermediate piping, oil reservoir, motors, and controls in one package, are depicted in 4-page Bulletin 47-45. Construction features and installation are set forth. Vickers, Inc.

33

INTERCOMMUNICATION AND SOUND SYSTEMS—Eight-page booklet, entitled "Sound—A Modern Control System," deals with line of voice-paging and music systems. Microphones and control units, relay-operated amplifiers,

For Any Atmosphere—



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From Century's wide range of types and sizes you can select the right motor, properly protected to satisfy all popular requirements. You can be confident that the right Century motor on your equipment will provide a long life of satisfactory performance.

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553

ThredKut* INCREASED OUTPUT 4 to 1

... reports
JOHN L. MOROSINI
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Representative

"Prior to using THREDKUT,* this customer had tried several types of cutting oil in tapping 1½" dia. x 1" holes in very tough cast steel, with a maximum production of 50 tapped holes before sharpening was necessary. On switching to THREDKUT,* output immediately increased to 200 tapped holes between sharpenings. Here is another instance where THREDKUT* demonstrated its well-established reputation for licking a tough job."

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... Stuart's THREDKUT is a unique cutting oil carefully manufactured to insure the maximum benefits from controlled chemical activity. Its outstanding performance on really tough jobs has long been recognized and its flexibility proved through exceedingly widespread use. The many time-tested values built into THREDKUT are serving the leaders of the metal-working industry, increasing efficiency and reducing costs.

Ask to have a Stuart Service Engineer discuss your cutting fluid requirements. THREDKUT literature available on request.

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consoles, record changers, and sound reproducers are described and pictured. Executone, Inc.

34

JACKS—Simplex lever, screw, and hydraulic jacks of 3-, 5-, 8-, 12-, 20-, 30-, 50-, and 100-ton capacities are introduced in revised Bulletin Industrial 48. Construction features pictures, and specification tables are included. Templeton, Kenly & Co.

35

LIGHTING UNITS—Four-page Folder 74 deals with localized incandescent high-intensity lighting for machinery installations. Six standard models and a list of interchangeable parts for special lights are shown. Vimco Mfg. Co.

36

LIQUID PRESERVATIVE — called Rot-Stop, that protects wood, rope, and canvas from dry-rot, mildew, and decay, is described in 4-page folder. Outlines results of the Soil Burial Test, and contains price list. Rockford Paint Mfg. Co.

37

LUBRICATING OILS—Types DC 710, for high temperature use; DC 710G, for mechanisms continually exposed to heat, high humidity, or to weather; and DC 710R, for sealed-in precision instruments, are described in "Silicone Notes." Discusses properties, tests, lubrication values, and uses. Dow Corning Corp.

38

LUBRICATING SYSTEMS—Bulletin 801, 4 pages, explains the Centro-Matic lubricating systems for mass lubrication. Tells how they operate, and outlines installation. Lincoln Engineering Co.

39

MACHINE TOOL MOTORS — insulated with Fiberglas, are introduced in 12-page booklet. Describes typical uses and features, designers' objectives, and maintenance requirements. Illustration depicts parts of the motor that are insulated. Owens-Corning Fiberglas Corp.

40

MAGNETIC PULLEYS AND SEPARATORS—40(a) "Blueprint for Tramp Iron Removal" is the title of 4-page Bulletin 102-B covering magnetic equipment for industrial processing lines. **40(b)** A non-electric permanent magnetic pulley for separating magnetic from non-magnetic materials conveyed on a belt is the subject of 8-page Bulletin 501A. Eriez Mfg. Co.

41

MAGNETS AND MAGNETIC PULLEYS—41(a) Catalog 301-A, 12 pages, describes rectangular double-gap electro-magnetic, suspended, spout and plate magnets and wet type magnets for submerged installations. **41(b)** Six-page Catalog 260-A deals with the Perma-Pulley, a permanent alnico magnetic head pulley for belt conveyor systems. Includes illustrations. Dings Magnetic Separator Co.

42

MATERIALS-HANDING EQUIPMENT — including rubber-tired, and metal-wheeled hand trucks; shovel trucks; platform trucks; drum handlers; box and shelf trucks; lift trucks; and skid platforms, are presented in 60-page catalog. Also covers gravity and power conveyors, casters, waste receptacles, floor runners, and plastic aprons and sleeves. Includes pictures and prices. Washington Equipment & Supply Co.

43

OIL FILTERS—Illustrated 16-page catalog discusses oil filter applications for general industrial and machine tool use. Contains scaled diagrams of the

LITTLEFORD FORMS STEEL for All Your Needs

We make bins, machine pans, stacks, breechings, tanks. Also chutes, guards, vats, machine bases, special metal parts. In 65 years we've really learned how to serve industry. Let us help *you!*

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A CENTERED EYE IN 1 OPERATION

Precision CENTERED EYE Bending With DI-ACRO BENDERS

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at high hourly production rates. Both eyes and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

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DI-ACRO Precision Bending is accurate to .001" for duplicate parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

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"DIE-LESS" DUPLICATING showing many kinds of "die-less" duplicating produced with DI-ACRO Benders, Brakes and Shears.

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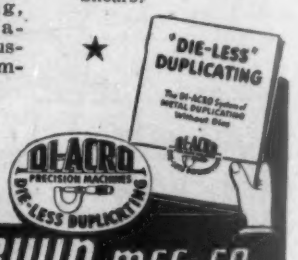

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It's a labor-saving SKIL DRILL* . . . gives you the speed you need for all ½ inch drilling in steel, 1 inch in wood. And back of its excellent performance are sound engineering, good design and a quarter-century of outstanding SKIL TOOL service. Whether you buy this drill or any one of 19 other SKIL DRILLS, you'll find you've never bought a better tool.

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Tool Expense is Excessive with Antiquated Checking Systems

Change to McCaskey Tool Control and you will save in a dozen ways—save tools and the time of both employees and machines.

The East Plant Motor Div., General Electric Co., Pittsfield, Mass., for example, reduced tool requirements and loss thru McCaskey Control. Mr. Charles W. Reagan, Tools & Methods Dept., told in a recent issue of Factory Management and Maintenance how these dollar-saving results were gained over a three year period:

1. Repaid cost many times over—vital factor in success of tool division;
2. Requirements by departments cut to minimum—more production with less tools;
3. Inventory loss held to fraction of 1 percent—losses almost negligible;
4. Hoarding of tools discouraged;
5. Clearance time for transferring or terminating employees cut to minimum—invaluable in placing responsibility for tools;
6. Serviceability of various types of tools compared—loss and breakage checked;
7. Readily adaptable to varied manufacturing needs;
8. Swift and accurate inventory of all tools by depts.; tool costs readily available;
9. System immediately operated by untrained and inexperienced employees.

Whether you have one or several cribs for production or maintenance work, McCaskey Control will cut your tool costs and prevent production delays. Write for a reprint of Mr. Reagan's article, "Flexible Tool Control Repays Costs Many Times Over," and similar reports of cost-reduction and improved operations in other well-known plants.

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PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada — The McCaskey Register Co., Watford, England

different types of filters, and specification charts. Purolator Products, Inc.

44

PACKAGING—Interior packing, concentrated loads, and production line packaging are featured in brochure. Photographs show entire packaging procedures. General Box Co.

45

PLANT LIGHTING—is the topic of 4-page Report 4, entitled "Procedures for the Correction of Plant Seeing Conditions." Plant lighting score card provides a means of checking and improving illumination, and maintenance is covered. Benjamin Electric Mfg. Co.

46

PLANT LOCATION—Industrial facilities of Massillon, Ohio, are presented in 16-page pictorial brochure. Describes communication and transportation, form of government and service, stores, labor conditions, water supply, power, fuel, tax rates, and other features. Massillon Chamber of Commerce.

47

PROTECTIVE CLOTHING — including Nitroflex aprons and sleeves; synthetic, leather, asbestos, and canvas gloves; and safety equipment are outlined in 4-page brochure. Describes fabrics, weights, sizes, and lists prices. Industrial Products Co.

48

PROTECTIVE COATINGS—Details on the chemical and physical properties, application instructions, and other data on protective coatings are compiled in 12-page catalog. The texts are available for ten major industries, giving information pertaining to each. Amercoat Div., American Pipe & Construction Co.

49

PUMP—Model M-P Duraflex 6600 neoprene rotor, high-pressure, positive displacement pump, with 40 g.p.m. capacity at pressures up to 150 p.s.i., is the subject of 4-page Bulletin 6000. Gives performance data, specifications, photographs. Marine Products Co.

50

QUALITY CONTROL—Entitled "Inspecting Incoming Material," 4-page folder suggests procedures that may be followed from the arrival of material in a plant until it is finally accepted or rejected. Also outlines requirements for a typical inspector training course. Illustrates standard forms. North American Philips Co., Inc.

51

SAWS—Single- and multiple-cut rotary saws, for cutting holes in sheet metals, wood, plastics, plywood, wallboard, and other materials, are depicted in Form DM-947. Photographs show the saws used with portable electric drills on lathes and drill presses, and other power tools. Misener Mfg. Co., Inc.

52

SCREW ANCHOR—Form A-847 contains information on a plastic expanding screw anchor for use with standard wood and lag screws in any material. Includes drawings, specifications, and prices. Holub Industries, Inc.

53

SCREW PUMPS—Revised 20-page catalog gives descriptions, capacities, and uses of internal and external screw pumps, horizontal and vertical, for crude oils, fuel oils, greases, acetates, and semi-fluids. Includes information on horsepower ratings, viscosities, installation, and maintenance. Sier-Bath Gear & Pump Co.

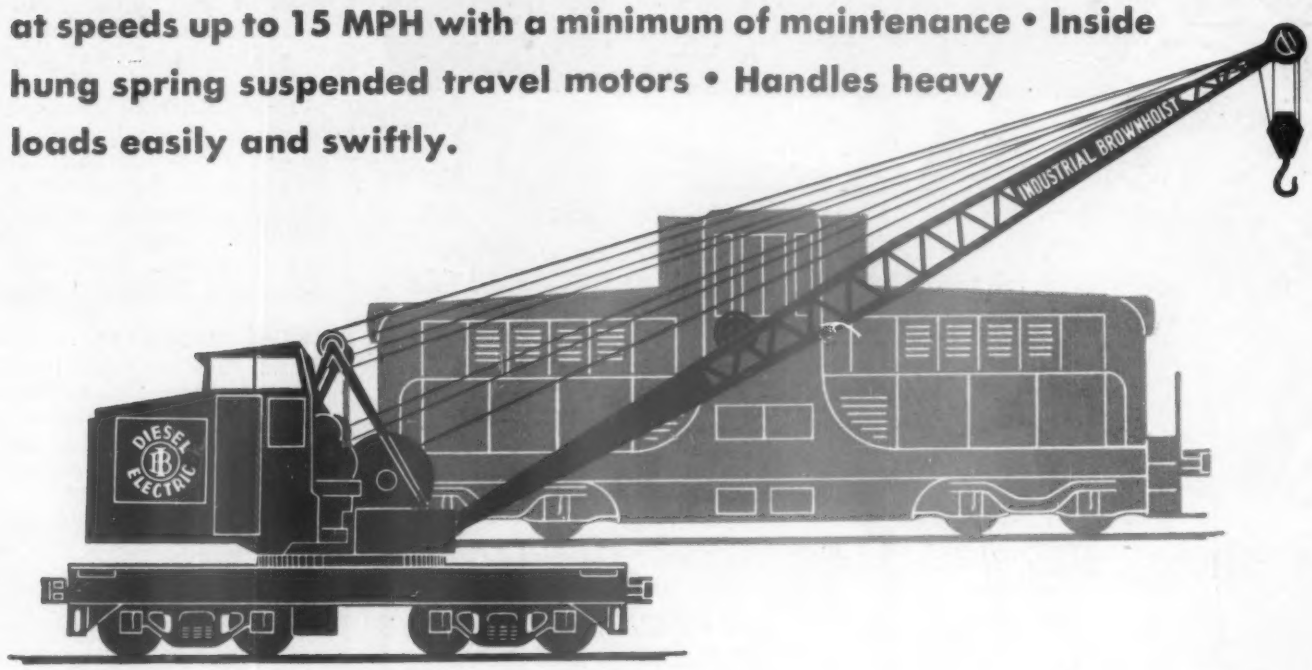
54

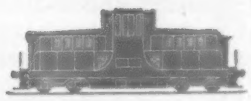
SCREWDRIVER—with automatic screw-

NOW AVAILABLE . . . BROWNHOIST DIESEL-ELECTRIC LOCOMOTIVE CRANE

(PATENT APPLIED FOR)

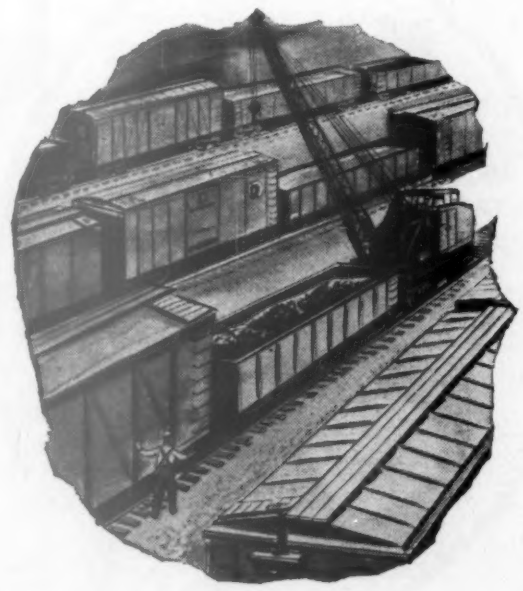
Versatile new BROWNHOIST CRANE doubles as switch engine • Travels at speeds up to 15 MPH with a minimum of maintenance • Inside hung spring suspended travel motors • Handles heavy loads easily and swiftly.





You get *double duty* from the new Brownhoist Diesel-Electric Locomotive crane . . . a heavy duty switch engine that *operates at minimum cost!* A powerful, rugged unit built to absorb shock and strain day after day. Switching in your yards with low fuel and maintenance costs. No soot or coal dust. Rapid acceleration. Electric swing available at additional cost. You get all this plus . . .

Low-cost CRANE operation. The patented monitor-type cab with its 360° visibility assuring greater safety, less operator fatigue, more materials handled per man hour. *Other safety features* include worm-driven boom-hoist and 14″ clearance between car body and revolving upperworks. In the new Brownhoist Diesel-Electric crane you get all the many engineering and construction advantages that have made Brownhoist cranes the top choice in industry. *Write now for complete particulars* about this up-to-the-minute crane and car-switching unit.



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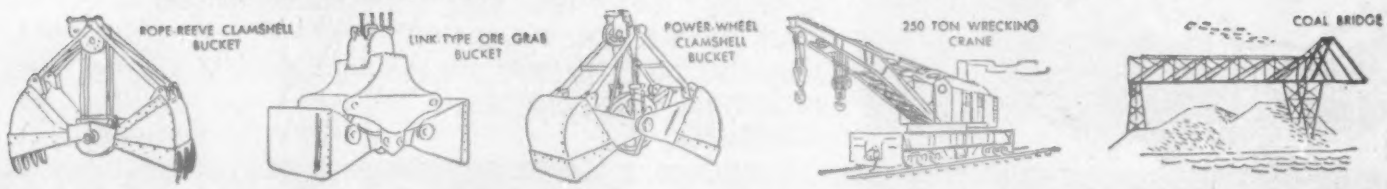

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MANY DAIRIES THAT SHIP FROZEN CREAM IN 4-GALLON CARTONS USE **PERMACEL-77** PAPER MASKING TAPE TO SEAL AND HOLD TOPS ON TIGHT.

SAFETY GLASS MAKERS FIND **PERMACEL'S** TRANSPARENT COMPANION, **TEXCEL TAPE,** INVALUABLE FOR HOLDING TOGETHER ALTERNATE LAYERS OF GLASS AND PLASTIC DURING MANUFACTURE.

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holder and aligner, is featured in brochure. Operation is described with sketches, and construction and functions are detailed. Includes specifications. Eslick Products, Inc.

55

SHEAVES AND PINS—Four-page Bulletin 947 contains information on sheaves and pins. Photographs show installations, and features are set forth. The Tool Steel Gear & Pinion Co.

56

SLING CHAINS—Description and specifications of steel, iron, and alloy sling chains are set forth in 28-page Catalog DH-1124-C. Attachments and uses are charted. Tensile strengths, Rockwell hardness, safe loads, and other data are included. American Chain Div., American Chain & Cable Co., Inc.

57

SPEED REDUCERS — Four-page Data Sheet 8974 contains technical information on one-Drive, fan-cooled speed reducers. Tables show combined mechanical and thermal ratings, and selection details. Michigan Tool Co.

58

STEEL SHELVING—as well as cabinets, shop boxes, stock carts, tool stands, chairs, trucks, and other equipment, are pictorially presented in 6-page folder. Lists sizes and prices. Precision Equipment Co.

59

STRIP CHART RECORDER—59(a) Bulletin C2, 8 pages, contains design, operating, and specification data on a strip chart recorder known as Capacilog "Electronic Scriber." Measuring, indicating, recording, and controlling functions are explained, with illustrations. **59(b)** A 16-page technical data book entitled "Educational Bulletin No. 7," contains operational diagrams, schematic drawings, charts, and listings, of the recorder. Includes specifications and mounting dimesions. Wheelco Instruments Co.

60

TUBING FITTINGS—Line of stainless steel flanged Type 316 Conical End fittings for light-gage O.D. tubing is presented in 23-page Catalog 847. Covers physical characteristics, fabrication, adaptability to other fitting types; includes stainless steel analysis tables, bursting pressure data, and installation methods. Tri-Clover Machine Co.

61

V-BELTS DRIVES—"Pre-engineered" stock Texrope drives is the subject of 144-page indexed Catalog 20 B 6956. Lists more than 22,000 drives for applications from 1 to 150 horsepower. Contains illustrations and engineering data. Allis-Chalmers Mfg. Co.

62

V-BELT SHEAVES—Bulletin 305, 16 pages, lists dimensions, specifications, pitch diameters, number of grooves, prices, and other data on V-belt sheaves. American Gear & Mfg. Co.

63

VALVES—Pneumatic control valves and controller accessories are cataloged in 36-page revised Bulletin 277-2. Includes color code showing the identifying enamel finishes, specifications, information on computing valve sizes, tabes, and formulae for determining valve size for different installations. Air filter sets, ventilating dampers, and other accessories are illustrated. The Foxboro Co.

64

VENT CAPS AND PIPE COVERS—made of vitrified clay, are featured in illustrated Form 1262. Includes data on structure, dimensions, and specifications. The Robinson Clay Product Co.

FIG. 732
Drawer is extra
Patd. & Pats. Pend.

Fig. 2197

HALLOWELL

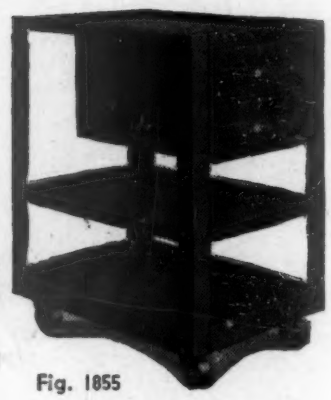

Fig. 1855

SHOP EQUIPMENT OF STEEL . . .

built for long service and hard wear

Every requirement of shop and factory can be filled efficiently with "Hallowell" Shop Equipment of Steel. It includes: Work-Benches, Foreman's Desks, Tool Cabinets, Stools, Chairs and Trucks — in a wide variety of styles and sizes — built of sturdy, hard-wearing steel — a construction that has made "Hallowell" a ***buy word.***

"Hallowell" Ready-Made Work Benches of Steel are definite assets to any shop. Strong and sturdy, they're designed to stand firm and rigid without costly bolting to the floor — to withstand constant use and abuse. More than 1300 combinations . . . interchangeable sections . . . five heights and widths and seven standard lengths. The "Hallowell" can be moved easily and individual benches can be joined end-to-end to form a continuous work bench of any length.

For further details, write for your "Hallowell" Catalog.

"Unbrako" and "Hallowell" Products are sold entirely through Industrial Distributors.

OVER 44 YEARS IN BUSINESS

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA., BOX 546 · BRANCHES: BOSTON · CHICAGO · DETROIT · INDIANAPOLIS · ST. LOUIS · SAN FRANCISCO

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Now- Coca-Cola* in CUPS

Readily available to all your employes

Here's a new Westinghouse, completely automatic, Coca-Cola Cup Vendor that you *can't* buy. You can't even rent it! But it is available FREE on a split profit basis through your local Coca-Cola Bottler. All you need do is supply small locations where employes can pause for a refreshing drink. Your local Coca-Cola Bottler does all the rest in daily service that keeps the Cup Vendor constantly operating.

This amazing Westinghouse Vendor automatically serves a cup of cold, refreshing Coca-Cola for only a nickel.** Or, if change isn't available, it accepts either a dime or a quarter, dispenses the drink and makes change automatically.

Two models available—VA-10 and V-4 which serve 1000 cups and 400 cups respectively without replenishment. Both are approved by the Underwriters' Laboratories, Inc.

Coke* in Cups helps build employe morale . . . And the Vendor profits can be used for any employe benefit fund.

*"Coca-Cola" and its abbreviation "Coke" are the registered trade-marks which distinguish the product of The Coca-Cola Company.

**Higher in some areas depending on local state taxes.

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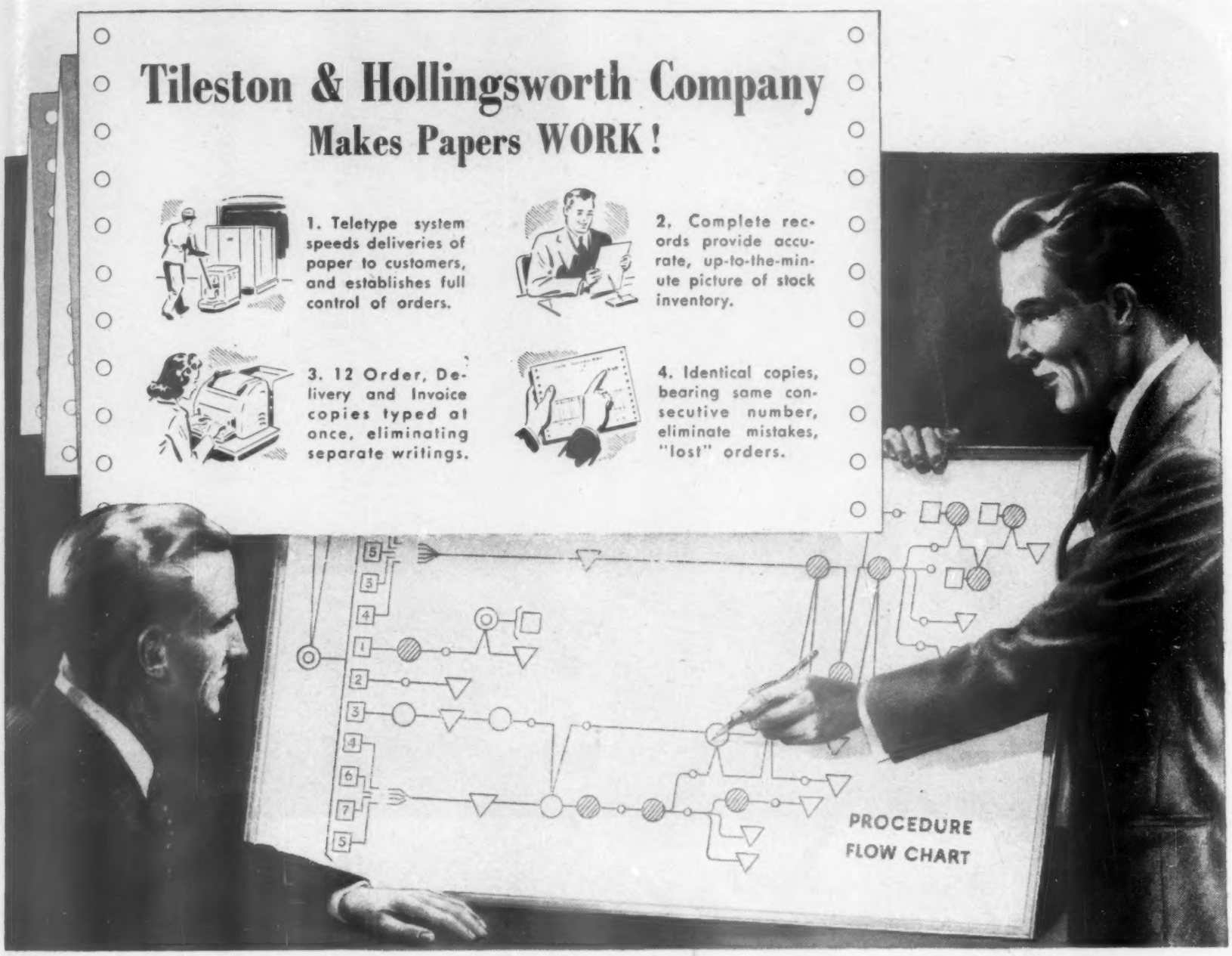
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"Paperwork Simplification" strips away all waste motion and effort in the writing and handling of business forms. Result: drastic cutting of overhead and improved employee morale. "Paperwork Simplification" also gives you more accurate records, quicker. Result: tighter control of production, distribution, sales, inventory . . . *important reductions in your overall cost of doing business!*

"Paperwork Simplification" is based on an analysis of your forms writing and handling by Standard Register specialists using exclusive techniques. The facts obtained are studied, utilizing Standard Register's unique facilities and vast experience in setting up efficient paperwork systems in *every* type of business. Then improvements are suggested. Procedures are streamlined by combining, eliminating, and simplifying operations. A marginally-punched continuous form is then designed, produced, and guaranteed to meet the highest standards of precision, quality and *efficiency*.

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You can save steel and time in the making of dies for blanking, trimming, beading, or any application involving the cutting of sheet metals to regular or irregular shapes, by assembling them from FCC Composite Steel Die Sections.

These prefabricated die parts consist of fine tool steel cutting edges, in a selection of grades, electrically welded by a special process to non-hardenable mild steel bases. Thus, screw and dowel holes may be easily drilled after heat treating, and there are numerous other advantages that will be immediately obvious to the die maker.

Thousands of die shapes may be made up from combinations of thirty-five standard sections. Specially shaped sections are manufactured to customers' specifications in five to ten days.

● Make *your* dies this money-saving way—full data on request.

Write for New Booklet:
COMPOSITE DIE SECTIONS

Contains complete data on 35 Standard Die Sections, from combinations of which thousands of die shapes can be made—also full information on Special Die Sections, and how to order.

● *Get your copy . . . write for it today.*

ADDRESS DEPT. FM-59

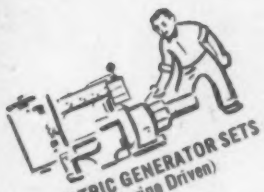
W&D 563

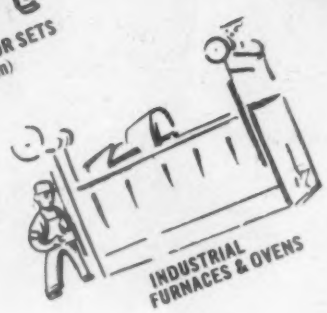
ALLEGHENY LUDLUM STEEL CORPORATION

Forging and Casting Division
Detroit 20, Michigan

FOR INDUSTRIAL EQUIPMENT

TRY WAA FIRST!





Millions of dollars' worth of industrial equipment and supplies still remain in War Assets inventories of surplus war material. Some of the equipment is unused; some of it is used. All for sale at extremely attractive prices.

Are you considering the purchase of additional equipment for your plant? Before you place an order, check with the nearest WAA Customer Service Center—it will have listings of current offerings of all items featured in this advertisement. Among these you are likely to find exactly the item you want, at a price that will save you a substantial amount of money.

All items are subject to prior sale

Our inventory includes: Industrial Furnaces & Ovens • Welding Equipment (Arc, Resistance & Gas) • Conveyors (All types) • Industrial Trucks (Hand & Power) • Hoists (Chain & Electric) • Electric Generator Sets (Gasoline-Engine Driven) • Motor Starting & Control Equipment • Industrial Fans

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1402—2

When you're glad you have a Snap-on

Pulling up Bearing on Swing and Traction Reverse Shaft . . .

Snap-on's Heavy-Duty Blue-Point Boxockets give you powerful leverage to turn those stubborn, large size nuts and bolts. There is no danger of slipping for Boxocket openings completely encircle the nut . . . giving equal pressure on all six sides. You can really "bear down" and complete the job quickly and safely. Each wrench head has a locking button which engages a lock hole in the handle requiring deliberate action to unlock the combination.

Blue-Point Boxocket heads are compactly designed to reach into places where many other types of wrenches cannot possibly be used. The double hexagon broaching gives you the additional advantage of a short turning arc where obstructions restrict free swinging. Sizes available from $1\frac{1}{16}$" to $3\frac{1}{8}$" with four handles from 18" to 36".

Unit Crane & Shovel Corp. use many Snap-on tools in the production of their complete line of rubber-tired and crawler-mounted material handling equipment.

SNAP-ON TOOLS CORPORATION • 8044-L 28th Avenue, Kenosha, Wisconsin

International Division: Kenosha, Wis. U.S.A.

WORKER EFFICIENCY HIGHER, MAINTENANCE COSTS LOWER...

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Brighten work areas with *Liquid Aluminum*...the ideal one-coat finish. It lasts longer than ordinary paint...stands up better...costs less to apply. And its soft, yet brilliant, reflection of light assures greater worker efficiency, lower lighting bills.

For additional maintenance savings, use *Liquid Aluminum* on metal everywhere—fences, window frames, storage tanks, pipes, equipment of all kinds. It protects against rust, corrosion, smoke and fumes.

Protect your roofs, too...add to their life and subtract from upkeep...with *Liquid Aluminum* Roof Coatings. They protect built-up roofs from blistering, peeling, drying out and alligatoring... guard metal roofs from rust...keep under-roof temperatures cooler in summer, warmer in winter.

Reynolds Pigments...minute, polished particles of highest purity aluminum, quality-controlled from bauxite mines to you...are used in the best aluminum paints and coatings. When you buy a good brand, chances are it will be made with Reynolds Pigments...for Reynolds works closely with most of the country's paint and coating manufacturers.

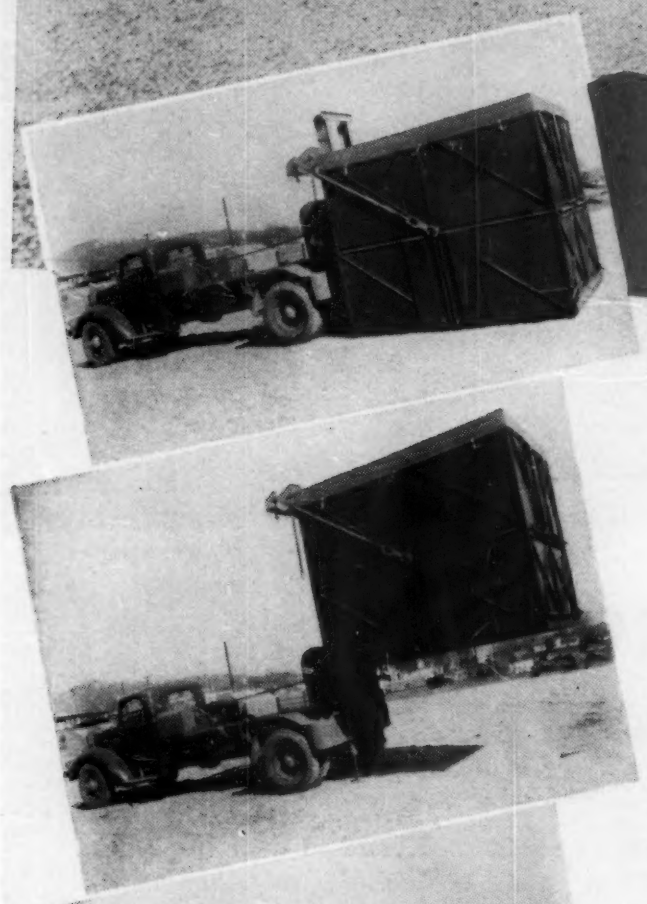
Let a Reynolds technician show you the maintenance savings possible with *Liquid Aluminum*. Ask your supplier, or write Reynolds Metals Company, Pigment Division, 19 East 47th Street, New York 17, New York.

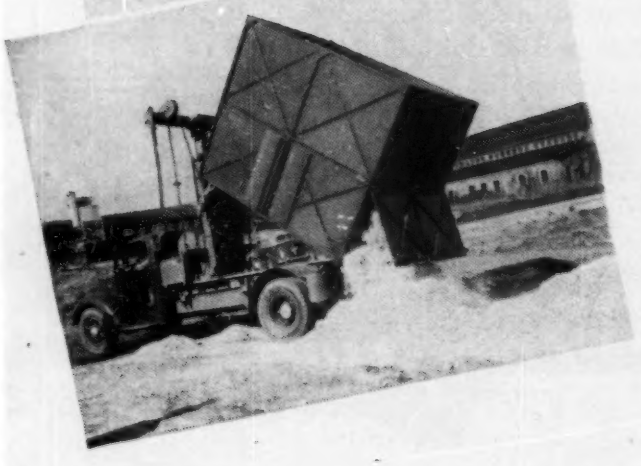
REYNOLDS METALS

IT'S MORE THAN PAINT...IT'S.

REYNOLDS ALUMINUM PIGMENTS

LIQUID ALUMINUM





Dempster Engineers developed the Dempster-Dumpster Type "ARLF" to meet a manufacturer's problem in handling large quantities of bulky, cumbersome loads in an efficient and economical manner. Adaptability to the widest variety of materials and uses soon gained general acceptance for the "ARLF" and today it is providing efficient materials handling in some of the nation's leading industrial plants.

Looking at the installation illustrated on this page, it is easy to visualize the tremendous savings in payroll, maintenance and operational expense that result when one man and one truck handles 25 bodies, each having a capacity of 21 cubic yards.

At left, the four pictures, from top to bottom, show how the truck hoisting unit handles a body. First: Truck Hoisting Unit prepares to pick up body. Second: Operated from controls in the truck cab, the hydraulic hoisting unit lifts the load vertically. Note how the automatic hydraulic stabilizing jacks provide perfect balance for the load. Third: Load moves forward to carrying position on the truck for hauling. Fourth: At destination, body is dumped by tilting, or load can be lowered to the ground without being dumped.

Dempster-Dumpster bodies of capacities from 1½ to 21 cubic yards are made in the form of tanks, racks and open or closed for use with every type of material whether it be gas, liquid or solid. So regardless of the type or size of material you handle, it will pay you to investigate the Dempster-Dumpster System. A letter from you will bring illustrated literature and full information on this remarkable system of materials handling.

DEMPSTER DUMPSTER
TRADE MARK REG.

DEMPSTER BROTHERS, Inc.
4127 Springdale, Knoxville 17, Tenn.

PRODUCTION COSTS GO DOWN

with ARO tools on assembly lines

Tightening screw in drive unit assembly. Aro Model 22LAH.

Driving No. 2 self-tapping screw in switch on controls. Aro Model 7000.

The General Electric Company, Trenton Plant, manufacturer of automatic washers installed Aro screw drivers, nut setters, balancers, oilers and filters on assembly lines. The result—complete assemblies *faster* . . . with *less labor* and *lower cost!* Also, inspection showed that torque requirements were "right on the nose".

It will pay you to have a trained Aro field engineer check your assembly problems. An on-the-job study may reveal many ways to increase your production, reduce fatigue and cut costs with ARO Air Tools. The Aro Equipment Corporation, Bryan, Ohio.

ening screws in drive assembly, using Aro Model 22LAH.

Tightening bolts on balance ring hub. Aro Model 106 Impact Wrench.

Driving down screw on flanges of apron using Aro Model 22LPH.

ARO AIR TOOLS

ocked by Aro distributors everywhere

Send for Catalog!

The Aro Equipment Corporation, Bryan, Ohio.

Without obligation, please send us your new fully illustrated Air Tool catalog No. 46 which also gives complete specifications on all Aro tools and accessories.

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Street.....

YOU FURNISH THE STEEL

LYON WILL MAKE THE PRODUCT

STANDARD LYON PRODUCTS

CONTRACT PRODUCTION OF SHEET STEEL ITEMS

(GAUGES FROM 8 TO 30)

• Here's how you can speed up plant expansion, boost production, or turn surplus steel inventory into cash. (1) If you can supply us with 12 to 24 gauge sheet steel and certain sizes of band steel, we will supply you pound for pound with any selection of LYON standard products now in production. (2) We will manufacture to your specifications, in Lyon production run quantities, assemblies, sub-assemblies or parts in gauges No. 8 and lighter up to No. 30. (3) If you have surplus steel sheets or band steel on order or in inventory, Lyon will pay current prices for usable sizes. Write, wire or phone your nearest Lyon dealer or branch office.

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Branches and Dealers in All Principal Cities

GENERAL OFFICES: 1112 MONROE AVENUE, AURORA, ILLINOIS

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• Lockers	• Display Equipment	• Cabinet Benches	• Bench Drawers	• Shop Boxes	• Service Carts	• Tool Trays	• Tool Boxes
• Wood Working Benches	• Hanging Cabinets	• Folding Chairs	• Work Benches	• Bar Racks	• Hopper Bins	• Desks	• Sorting Files
• Economy Locker Racks	• Welding Benches	• Drawing Tables	• Drawer Units	• Bin Units	• Parts Cases	• Stools	• Ironing Tables

Wickwire's wire drawing dies are accurate within .0003 of an inch.

In Rope Wire too—Reducing Methods Must be Safe

Making rope wire slim and strong is as scientific as any reducing method for humans—and a lot more certain of correct results. At the Wickwire plant, the size and sequence of wire drawing dies are carefully calibrated to provide for uniform reduction and to avoid the possibility of wire becoming brittle. Skipping of drafts, another cause of wire embrittlement, is eliminated by use of continuous wire drawing machines which will not function unless all dies are in their proper place.

Drawing, cleaning, heat treatment—every step necessary to reduce Wickwire Rope Wire to final size is closely supervised. The finished wire is accurate within a fraction of a thousandth of an inch. Production of strands and finished ropes is equally exacting.

All this adds up to Wickwire Rope being the logical choice of rope users who demand the utmost in performance, safety and long life. Wickwire Rope is available in all sizes and constructions, both regular lay and WISSCOLAY *Pre*formed. Wickwire Distributors and Rope Engineers are always ready to help solve your wire rope problems and supply the right rope for your needs.

HOW TO REDUCE ROPE COSTS AND PROLONG ROPE LIFE

Thousands of wire rope users have found that the information packed in the pages of "Know Your Ropes" has made their work easier. It's full of suggestions on proper selection, application and usage of wire rope. It's easy-to-read and profusely illustrated. For your free copy, write—Wire Rope Sales Office, Wickwire Spencer Steel, Palmer, Mass.

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A PRODUCT OF THE WICKWIRE SPENCER STEEL DIVISION OF THE COLORADO FUEL AND IRON CORPORATION

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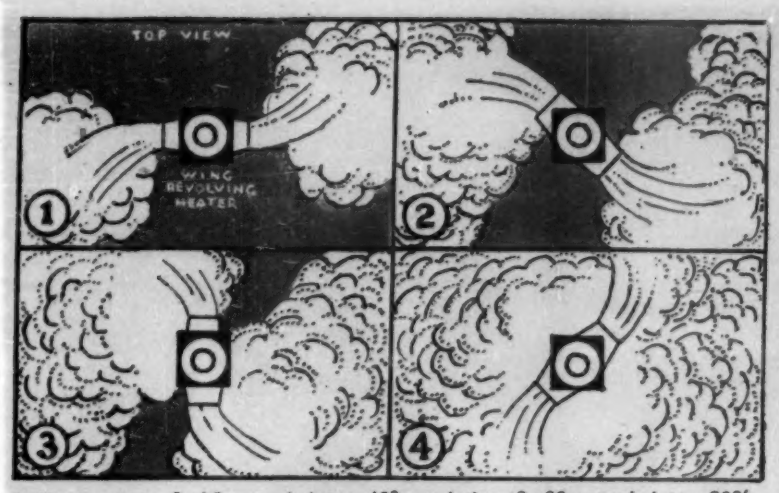
PACIFIC COAST SUBSIDIARY—The California Wire Cloth Corporation, Oakland 6, California



1. Heater starts. 2. 15 seconds later, 45° revolution. 3. 30 seconds later, 90°. 4. 45 seconds later, 135° revolution.

Revolving Discharge Outlets for Thorough Heat Coverage

•

Write for Bulletin HR-5

Wing Revolving Unit Heaters keep the heated air moving, circulating around obstacles, seeking out far corners, spreading an even uniform, healthfully invigorating blanket of warm air over the entire working area. Wing Revolving Unit Heaters do what *no other form of plant heating* can do. It circulates the warm air completely and thoroughly over the entire working area, regardless of obstructions. It eliminates unhealthful hot and cold spots, chill corners or sickening, concentrated blasts of hot air.

L. J. Wing Mfg. Co.
162 W. 14th Street
New York 11
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Wing REVOLVING UNIT HEATERS

Handle Scrap FASTER-EASIER

This Burro is handling scrap faster and easier because it moved itself and several cars to the job quickly — and started work without delay. Burros equipped with magnet, clamshell bucket, dragline bucket, tongs or hook are saving time and money on many jobs in every type of industry. Their powerful draw bar pull (7500 lbs.) and fast travel speeds (up to 22 MPH) make them efficient switch engines too—you can spot cars where and when you want them at a moment's notice. There's no waiting time when a Burro is on your *track*.

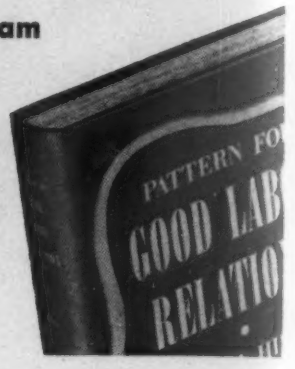
Write for Descriptive Bulletins

CULLEN-FRIESTEDT, 1321 S. Kilbourn Ave., Chicago 23, Ill.

CULLEN-FRIESTEDT CO., CHICAGO 23, ILL.

This "ounce of prevention" means FEWER LABOR PROBLEMS

Here's a program that wipes out the causes of labor troubles—that builds up production and profit



THIS book shows you a direct, practical method of eliminating the causes of labor trouble. It builds up a definite pattern of management-labor relations designed to give each employee the sense that he is being dealt with fairly. The book shows management how to assume its full responsibility in employer-employee relations. It helps you design a special organization within your business to manage employee relations and maintain a high level of employee satisfaction. By following this organized pattern of conduct, you can cut down union trouble considerably, and increase operating efficiency as reflected in more sales, greater production, and bigger profits.

Just published!

PATTERN for GOOD LABOR RELATIONS

By LEE H. HILL

Publisher, *Electrical World, Electrical Construction and Maintenance,* and *Electrical Wholesaling.*

McGRAW-HILL INDUSTRIAL ORGANIZATION AND MANAGEMENT SERIES

$3.00

This new approach to the solution of labor trouble is based on the recognition of *people* as the foundation of any business. It shows you *why* employee consideration should come first, and *how* to develop a workable plan of action that keeps each employee highly satisfied and therefore most efficient. You'll encounter a *minimum* of union trouble once you put this tested plan into operation.

Here are the 10 helpful chapters:

1. **Labor Relations: One Segment of Employee Relations**
2. **The Price of Poor Employee Relations**
3. **What Do Employees Want?**
4. **Employee Morale**
5. **Management-Union Relations**
6. **The Public Interest in Collective Bargaining**
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Send me Hill's **Pattern for Good Labor Relations** for 10 days' examination on approval. In 10 days I will send $3.00, plus few cents postage, or return book postpaid. (Postage paid on cash orders.)

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Company .....
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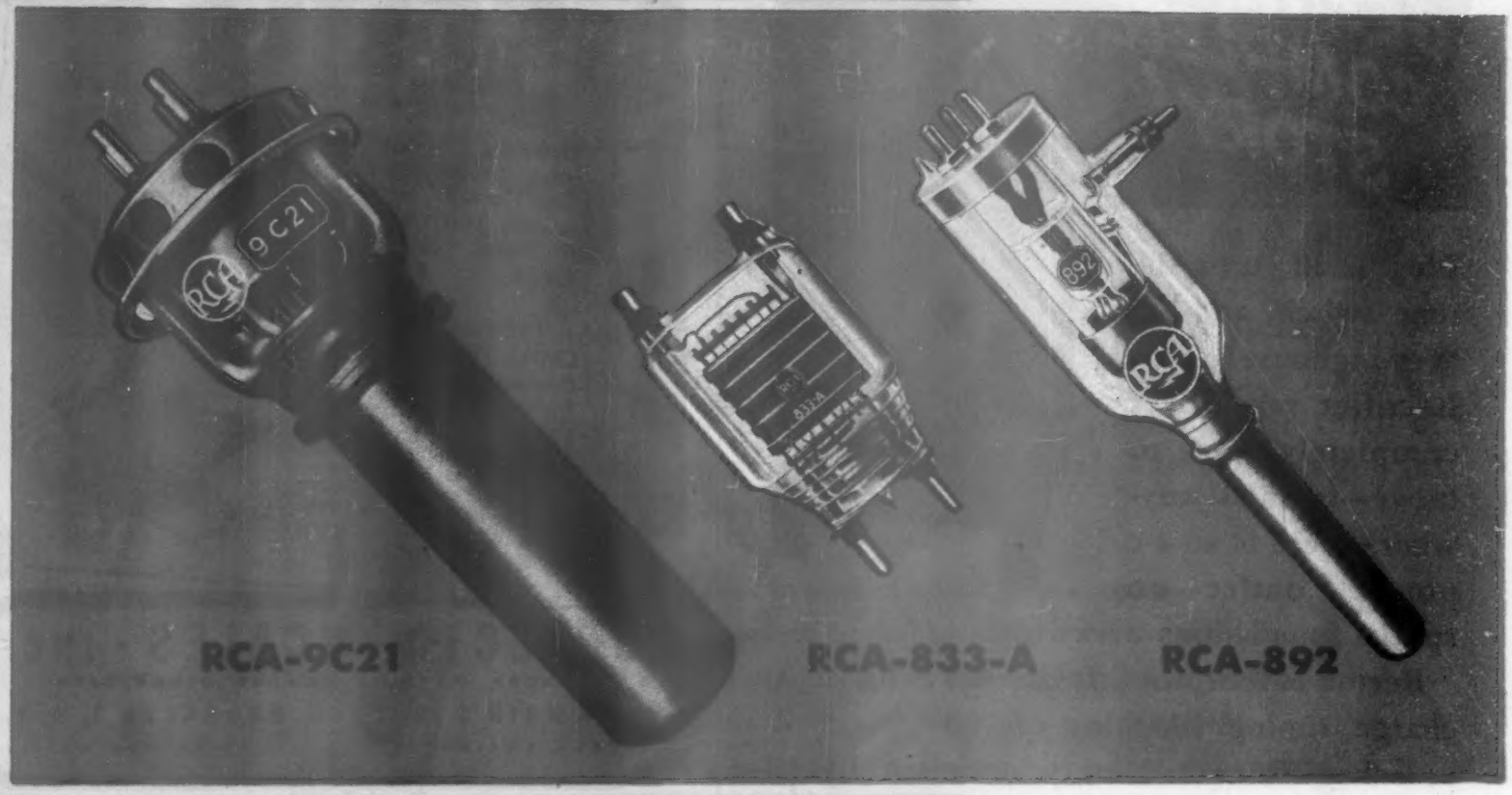
For economy in Electronic Heating...



Replace with RCA Power Amplifiers

RCA industrial electron tubes for high-frequency heating equipment embody the ruggedness, high quality and long-service life required for continuous-duty applications. You can count on them for top performance and economy.

The RCA Power Amplifiers illustrated are representative of a large and growing family of RCA electron tubes for industrial use.

At present, there are over 200 *standard* types. Included in this group is a comprehensive line of ignitrons and thyratrons for control applications, and an equally comprehensive line of high-vacuum and mercury-vapor rectifiers for low- and high-voltage applications.

When you need renewal tubes, look to RCA.

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Radio Corporation of America
Commercial Engineering
Section T-46L Harrison, N. J.

Please send me Bulletin No. 2-F19 R3 covering prices, technical description and interchangeability by type numbers of the complete line of RCA industrial electron tubes.

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PRINCETON, N. J.

IN RADIO AND ELECTRONICS—*THE FOUNTAINHEAD OF MODERN TUBE DEVELOPMENT IS RCA*

TUBE DEPARTMENT

RADIO CORPORATION of AMERICA

HARRISON, N. J.

FULLY AUTOMATIC

TRUCK BATTERY CHARGING...

GET THE COMPLETE STORY!

Plug it in, turn the time switch, and the Westinghouse Rectox Rectifier takes over completely. Easy to move—installs anywhere there is an a-c power outlet—no special foundations or wiring.

Rectox is foolproof. It handles rates of charge, timing, blocking of "flow-back" or leakage from the battery, automatically. High, full-load efficiency is maintained to as low as 25% of full load. For that reason, its economy of operation is excellent.

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PLANTS IN 25 CITIES... OFFICES EVERYWHERE

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DETECTO-GRAM CROSS TOWER MODEL

One more Detecto-Gram Scale to speed your production. Model 1C-71-05 is for bench work or hand packaging. Specially designed cross tower for speed—convenient commodity platter—registers every ¼ ounce to 16 lbs.

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MAKERS OF FINE SCALES SINCE 1900
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SCALE ENGINEERS IN ALL PRINCIPAL CITIES

Because of rising production costs FACTORY has been forced to raise the price of its PLANT OPERATION LIBRARY to 35 cents each

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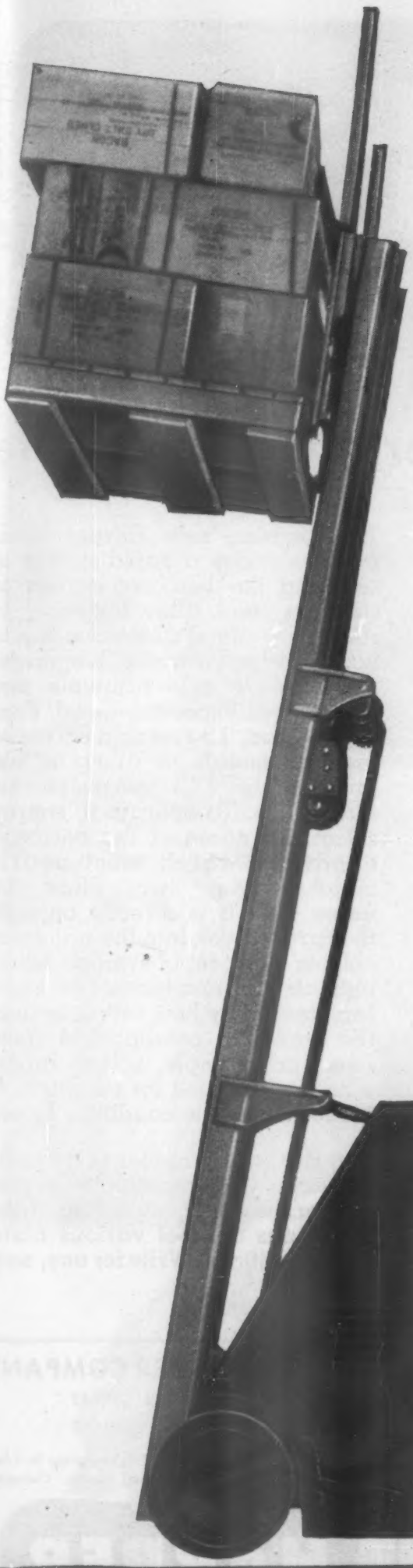
A full list of these valuable aids to production men will be found on page 305 of this issue



The **HIGHER** *you stack*
the **LOWER** *your cost!*

MOBILIFT

"Tiers to the Top"

Those upper levels of your storage space—are you taking full advantage of them? MOBILIFT's high lift elevator is designed to spot loads on the third or fourth tier as easily as at floor level—an advantage that cuts your costs in many ways.

- **Makes overhead space productive.**
- **Eliminates back-breaking muscle methods.**
- **Lifts materials too heavy for hand stacking.**
- **Clears floor space for extra production.**
- **It's safer — it's faster — it's less expensive.**

High stacking is only one of the many ways MOBILIFT can cut your storage and materials handling costs. Let one of our representatives show you how you can save with a MOBILIFT operation.

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MOVES MATERIALS LIKE A GIANT!
MOBILIFT CORPORATION, 835 S.E. MAIN STREET, PORTLAND 14, OREGON

HARPER fastening NEWS

HAVE YOU A CORROSION PROBLEM?

New Harper Computer Will Show Proper Alloy Bolt to Use

FREE
ON REQUEST TO EXECUTIVES, ENGINEERS AND OTHERS INTERESTED IN FASTENINGS

The amazing new Harper Computer provides a rapid means of selecting the best non-ferrous or stainless steel alloy fastening to resist any one of numerous conditions causing corrosion. It operates on the slide rule principle and qualifies as Excellent, Good, Fair, or No Good, 13 rust and corrosion resisting metals or alloys in approximately 142 corrosive environments. To operate it, simply, select the name of the corrosive condition which most nearly matches your own. Slide this name until it is directly opposite the arrow. Look into the adjoining column for a set of symbols which indicate the non-ferrous or stainless steel alloy best suited to resist the corrosive condition in question. For example, silicon bronze may be indicated for condition A, Monel metal for condition B, etc.

The Harper Computer is an indispensable working tool for anyone concerned with selecting alloy fastenings to meet various corrosive conditions. Write for one, now.

Harper Bolts RESIST CORROSION

Harper manufactures and stocks a vast variety of bolts, nuts, and other fastenings in all of the commercial rust and corrosion resisting alloys . . . brass, silicon bronze, naval bronze, Monel metal, and Stainless steels. Here, you are almost sure to find exactly the fastening you need.

If you have a difficult corrosion problem—one not fully answered by the Harper Computer—submit it to the Harper engineers. These men are specialists in the manufacture and use of rust and corrosion resisting fastenings. They'll be glad to study your problem and suggest a solution. No obligation.

The H. M. HARPER COMPANY
2651 FLETCHER STREET
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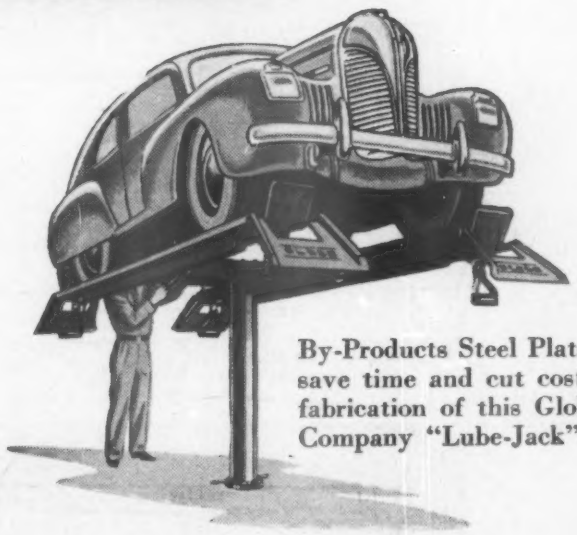
REPRESENTATIVES IN PRINCIPAL U. S. CITIES

HARPER SPECIALIZES IN EVERLASTING FASTENINGS

WHAT IS IT ?



By-Products Steel Plate Shapes save time and cut costs in the fabrication of this Globe Hoist Company "Lube-Jack".

It's an automobile lift in the raw! Just one example of how hundreds of companies save time and money with By-Products Steel Plate Shapes. They *buy* these *shapes* from us . . . avoid the cost of converting steel plate into components for fabrication or assembly.

We're equipped to assure prompt shipment in large quantities for any steel plate shape. By-Products has more than 150 major machines at work shaping steel plate. That means an investment of your own in expensive equipment will be unnecessary. It means, too, that you eliminate costly handling and shipping of scrap . . . you pay freight only on steel you actually use.

If steel plate shapes . . . whether flame-cut, sheared, pressed, bent, blanked or shaped in any manner . . . are components in your product, we believe you'll find it profitable to submit prints of your parts to us for quotation. Compare your costs and preparation time with an estimate from By-Products Steel Co., division of Lukens Steel Company, 421 Strode Avenue, Coatesville, Pa.

BY-PRODUCTS STEEL CO.

LUKENS
BY-PRODUCTS STEEL DIVISION

STEEL PLATE SHAPES

FLAME-CUT ★ SHEARED ★ PRESSED ★ BENT ★ BLANKED ★ WELDED

Users Save $10.08 per Wheel or Caster with

AEROL EQUIPMENT

High Performance Low Maintenance

Corrosion-resistant, spark-proof Aerol Aluminum Alloy Wheels have heavy-duty, solid rubber tires.

Silent, smooth-rolling Aerol Aluminum Alloy Casters are available in swivel or rigid type.

The average wheel or caster needs lubrication every month of its estimated six-year operating life, at a cost to the user of $10.08. Aerol Wheels and Casters are furnished exclusively with high precision Timken Tapered Roller Bearings that are factory-lubricated and sealed for their normal life. Think what this means in terms of four-wheel equipment—*Aerol not only saves you maintenance costs, but gives you advanced design and easier operation as well.*

IMPORTANT NOTICE!

If any of your Aerol Materials Handling Equipment ever needs replacing, merely ship it to us and we'll replace it at one-half the current list price.

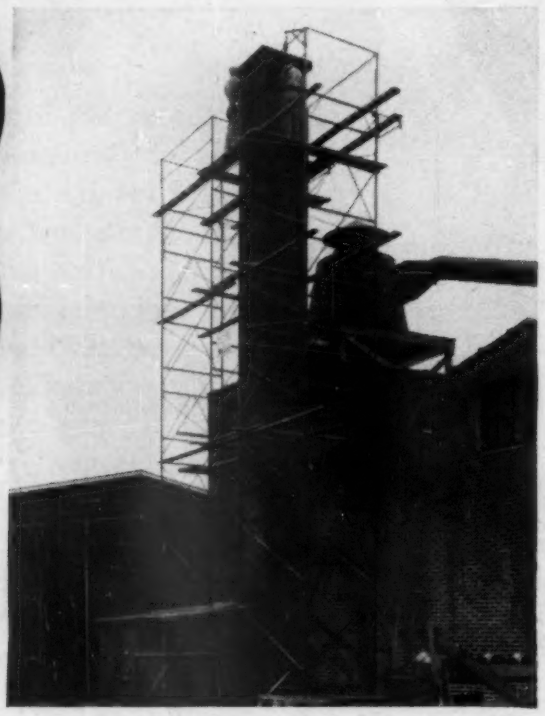
Immediate Delivery!

AEROL CO.

MODERN MATERIALS HANDLING EQUIPMENT
1823 E. WASHINGTON BLVD. • LOS ANGELES 21, CALIF.

All-aluminum wheels . . . rubber-tired wheels
pneumatic wheels . . . rigid casters . . . swivel casters
all-aluminum Universal hand trucks

FACTORY MAINTENANCE *Simplified* WITH



SAFWAY

All Steel SCAFFOLDING

e toughest kind of factory maintenance work hat which necessitates operating from above und level . . . difficult assignments like the e shown in the illustration above. But even toughest of assignments are made easy with FWAY SCAFFOLDING for SAFWAY structures ure MAXIMUM WORKER SAFETY; provide OMY PLATFORM AREAS at any desired position; enable faster operation because of the speed with which they are erected and dismantled.

SAFWAY is used for many types of FACTORY MAINTENANCE and REPAIR WORK. Get complete details on SAFWAY by writing for FREE BULLETIN NO. FM1247, today.

SAFWAY STEEL PRODUCTS, INC.
MANUFACTURERS OF TUBULAR STEEL SCAFFOLDING AND EQUIPMENT
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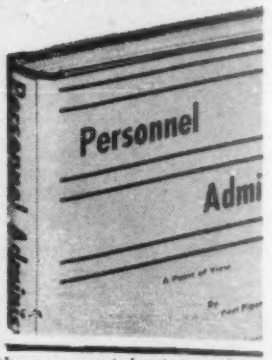

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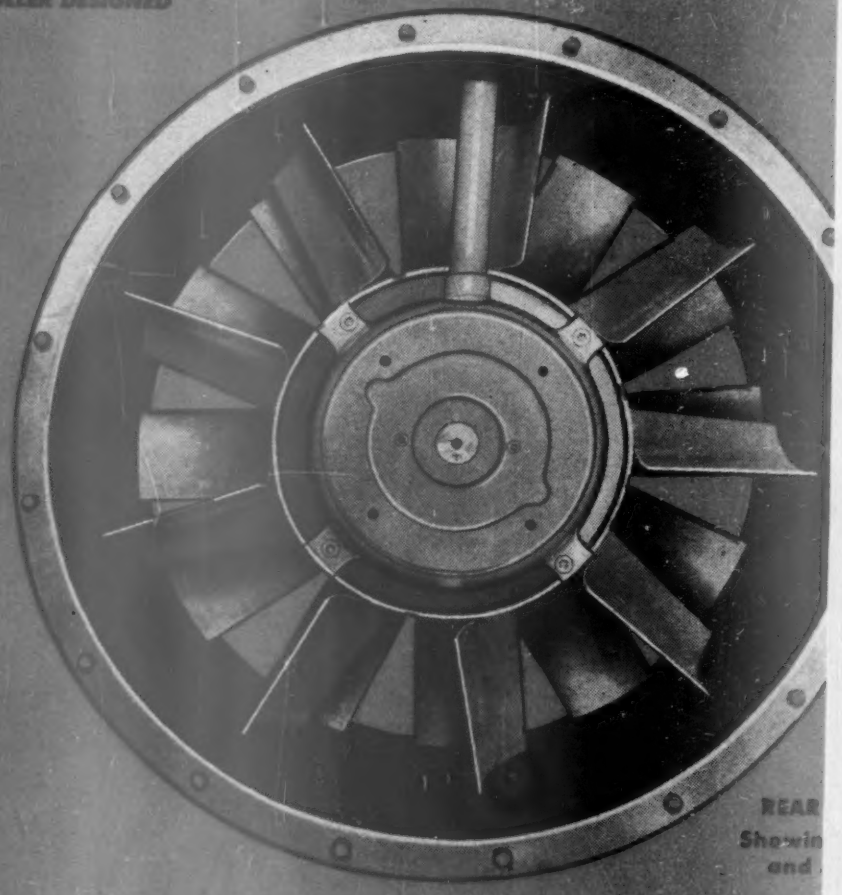

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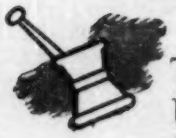

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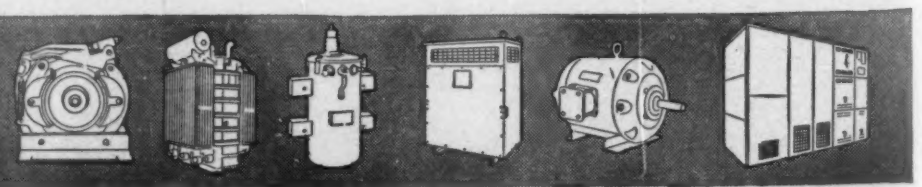

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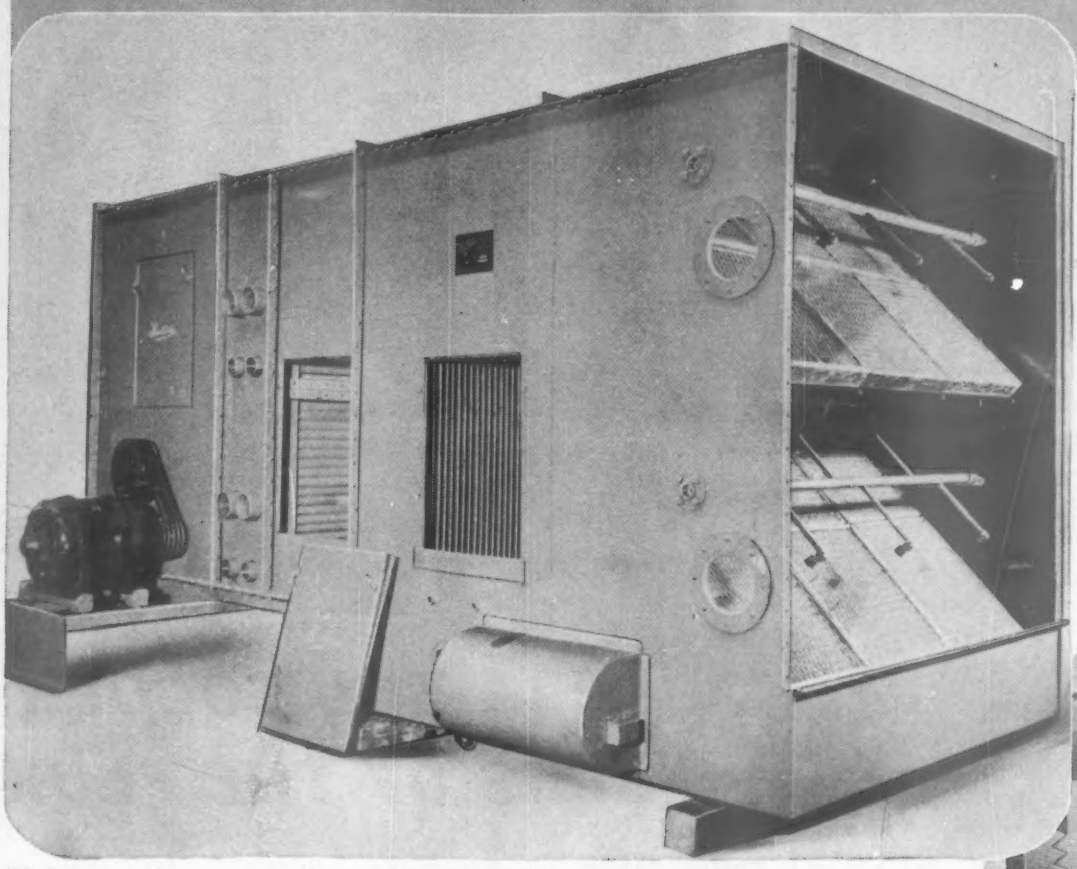
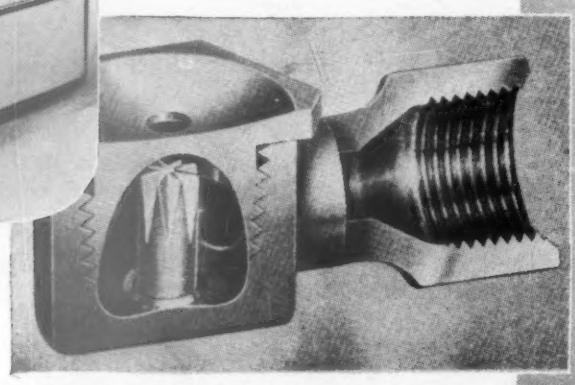
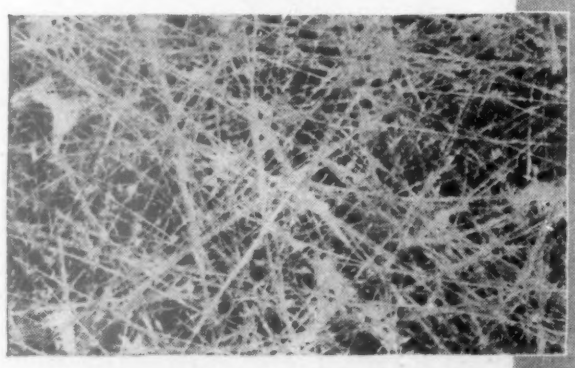


"Buffalo" Wet Glass Cell Air Washer, showing spray banks and filter packs at front.



Atomized curtains of spray from improved "Buffalo" nozzles such as the above, "bathe" the passing air constantly and thoroughly.



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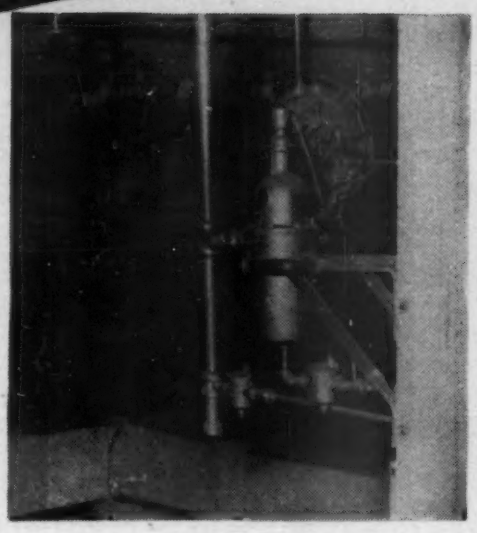

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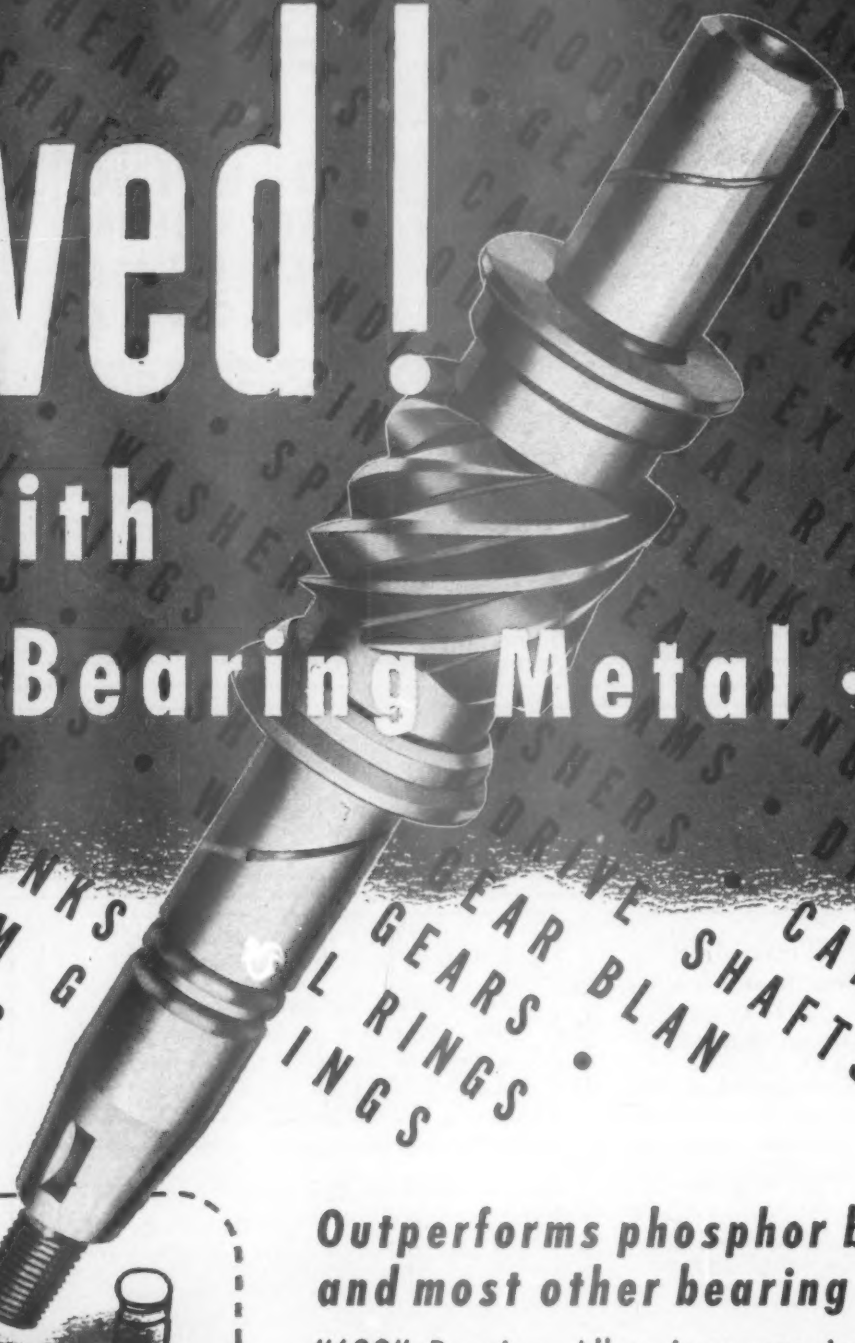

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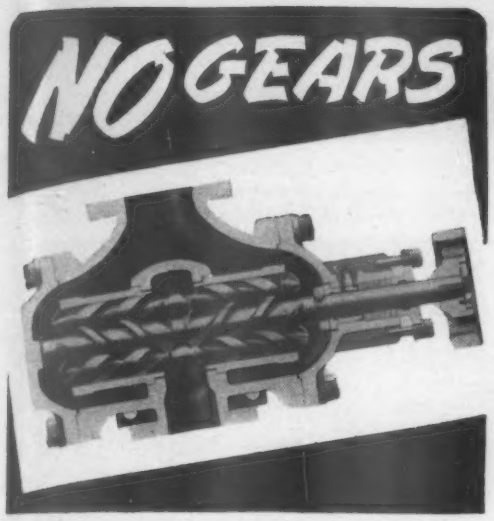

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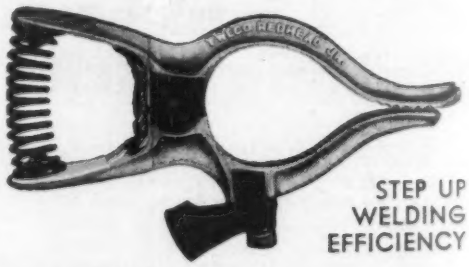

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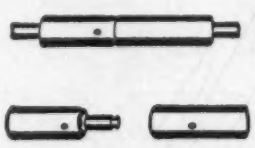

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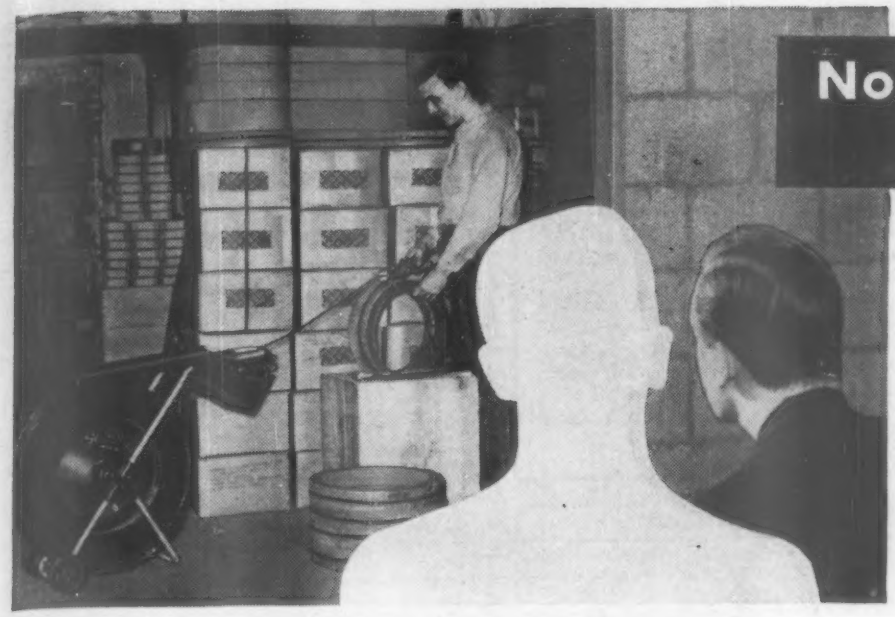

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TRAILER AXLE ENGINEER

Design engineer with 5 or more years design experience with heavy motor truck or trailer axles to head up axle engineering division of progressive company. Location West Coast.

P3119 Factory Management & Maintenance
68 Post Street, San Francisco 4, Calif.

Wanted FACTORY SUPERINTENDENT

Excellent opportunity for man who has successfully managed from 100 to 300 people in production work. Salary and bonus based on company net profits should bring income of $6000 to $12,000 a year. We have no union and no labor trouble. Key men in present organization will benefit from success of new superintendent, so complete co-operation is assured. We are manufacturers of sheet metal agricultural products. Previous experience in sheet metal fabrication not essential requirement. Located 300 miles from Minneapolis in growing city of 65,000. Write stating your age, experience, who you have worked for, length of time with each employer and reason for leaving, number of employees and any other information.

P2871 Factory Management & Maintenance
520 North Michigan Ave. Chicago 11, Ill.

Production Superintendent

Nationally known upstate New York organization offers excellent long range opportunity for man with executive ability—requires wide experience in manufacture of small metal parts – knowledge of press room, tools and dies, plating and small assembly imperative.

Write giving education, age, experience and salary expected.

P2829, FACTORY MANAGEMENT & MAINTENANCE
330 WEST 42nd ST., NEW YORK 18, N. Y.

ADDITIONAL POSITIONS VACANT ADS ON PAGE 308

WANTED
Industrial Engineers

By a well-known firm of Consulting Management Engineers, specializing in the Needle Trades and Textile industries.

Applicants should have a B.S. degree in Industrial Engineering from an accredited school or have a Mechanical Engineering Degree supplemented with equivalent industry experience in Industrial Engineering.

Operate with a permanent staff; therefore, place all men through an extensive training program.

Engineers already specialists in the industry we serve can secure staff appointments after indoctrination period.

For Junior Engineers, our salary schedules provide planned promotions within five years to Senior Staff status. This position carries a salary range of $9100 – $10,000, plus traveling expenses.

Since some traveling is involved, prefer single men, but will hire married men without children, up to 35 years of age. Children later, no bar to continued employment. Average assignment 10 months.

Please submit full details. Replies held in confidence.

P. 2684, Factory Management & Maintenance, 330 W. 42nd St., New York 18, N.Y.

Mechanical Engineer

Automatic package machinery experience, plant and administrative activities, to become executive in charge of manufacturing, Midwest, to 45 years, must be $15-18,000 calibre.

Jean Fields Agency
37 West 43 St., N. Y. 18, N. Y.

POSITION WANTED

(Continued from page 307)

MANAGEMENT ENGINEER or Administrative Assistant, Account exec., age 40, presently with outstanding mgmt. eng. firm desires return to opr. mgmt. side of bus. Qualified as ass't to a pres. who has prod. and mgmt. problems which could be solved by analysis and installation of adequate controls on policies, procedures, organization, costs, methods, prod. and qual. Eng. grad. Replies held in strict confidence. PW 3049, Factory Management & Maint.

INDUSTRIAL ENGINEER experienced in time study, rate setting, methods, cost estimating, job evaluation. Now employed but wishes to relocate in West Coast or Rocky Mountain States. Engineering degree, age 38. PW 3042, Factory Management & Maint.

ADROIT PERFORMANCE in any crisis: Industrial Relations, Cost Control, Manufacturing, Product and Methods Simplification. Action without friction! Personable; creative; graduate industrial engineer at most productive age. Well grounded in chemical, soap, drug product, food and confectionery industries. PW 3045, Factory Management & Maint.

PRODUCTION EXECUTIVE. Young manufacturing executive 14 years operating experience with nationally known companies, currently manager with one of nation's best management engineering firms; desires return to operate as Works Manager of Production Vice President. Experience in many fields, including mail order, radio, metal, foods, paint, glass, soft goods. Engineering graduate, age 40, full particulars upon inquiry. Replies held confidential. PW 3070, Factory Management & Maint.

C.P.A. NEW YORK-B C S, five years experience in manufacturing accounting covering standard costs, general accounts, taxes, S.E.C. Reports, to locate in metropolitan New York area. PW2181, Factory Management & Maint.

AVAILABLE
General Manager or Works Manager

17 years experience in all phases of manufacturing. A successful record in several types of industries. Presently employed as plant manager by a large eastern manufacturer. A college graduate. 40 years old. Resume and references furnished upon request.

PW-1996 Factory Management & Maintenance
330 West 42nd St., New York 18, N. Y.

SALES REPRESENTATIVE

Nationally known manufacturer of cleaning, stamping, drawing, rust proofing, grinding and similar materials has several territories available for high grade industrial salesmen experienced in the metal or food industries.

Permanent opportunities for men capable of servicing established accounts and building larger sales for the future. Salary to start, liberal straight commission arrangement later.

Reply giving full details to Box F.M.&M. #4, F. B. Johnston, 117 Liberty Street, New York 6, N. Y.

POSITION WANTED

FACTORY MANAGER—General Superintendent or Plant Engineer. Twenty five years proven results in all phases of management in medium heavy industry. Capable of directing all plant operational activities including engineering and development, maintenance-cost reduction, labor and personnel matters. At present similarly engaged. Available 4 to 6 weeks. Mechanical Engineer with professional engineer's license for state of New York. Eastern location preferred but will consider other locations. A-1 references and will stand complete confidential investigation. PW-3033, Factory Management & Maint.

GENERAL MANAGER—Processing and packaging industry as food, soap, confectionery, cosmetic, or similar. Position desired responsible for all phases of business including manufacturing, advertising, sales, financial, personnel and research divisions. Excellent administrator and coordinator with ability to draw best from assistants and work with directors. 14 years experience in processing and packaging industries. Age 37, now employed, degrees in industrial engineering, business and economics and management. Present income $14,000 salary plus $7,000 profit sharing, etc. Eastern location preferred. PW-3030, Factory Management & Maint.

PRODUCTION ENGINEER and Designer. Eight years manufacturing experience and three years sales experience. Five years executive positions as Chief Engineer and General Supervisor. Thoroughly schooled and experienced in production methods and tooling. Completely familiar with all phases tooling including precision casting. Thirty years of age—old enough to accept responsibility, young enough to fit into new surroundings. Married, two children. Free to travel anywhere. PW-2989, Factory Management & Maint.

ELECTRICAL ENGINEER, 10 years broad, diversified experience in development and application of electrical products for aircraft and industry. Professional license. Available as chief engineer of small company or similar responsible position. PW-2758, Factory Management & Maint.

MANUFACTURERS—

Let us represent you in the Chicago area.

Partners with technical education and experience desire consideration as manufacturers representatives with reputable firm.

Capable of dealing with engineering problems in the field.

R A 2716 Factory Management & Maintenance
520 N. Michigan Ave., Chicago 11, Ill.

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Two qualified and experienced men in operations management seek contact with financial interests owning manufacturing facilities in need of competent management. Team Know How embraces complete Facility Management in both mass and custom production fields. Experience scope includes all types of metal fabrication, foundry production, machine shop production, and complete assembly operations. Can be instrumental in obtaining large volumes of certain types of work.

BO-2852 Factory Management and Maintenance Magazine, 520 North Michigan Avenue, Chicago, Illinois.

SALARIED POSITIONS $2,500 — $25,000

This thoroughly organized confidential service of 37 years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC.
276 Dun Bldg. Buffalo 2, N. Y.

EXECUTIVES AND TECHNICAL MEN
Desiring Positions with Stability

We solicit inquiries from qualified candidates who desire to contact employers for positions paying to $25,000 per year. Confidential. Est. 31 years.

(Inquiries from Employers entail no obligation)

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Salaried Positions $3,600 Up

Our service is open for men who have initiative and ability with a good background, in all fields of Industry. No fee or registration charge is made until placed. State fully your qualifications.

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And TECHNICAL MEN

Qualified men wanted for openings throughout the United States. Write for application, or submit experience record. Inquiries solicited from responsible employers. All negotiations confidential. Est. 32 years.

HARRISON PERSONNEL SERVICE
20 W. Jackson Blvd., Chicago 4

MANUFACTURERS

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Reply RA 3024 Factory Management and Maintenance, 520 No. Michigan Ave., Chicago 11, Ill.

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Complete Refresher and Coaching Course for Professional Mechanical Engineers' State license examinations. Thorough; Reasonably priced. For details write:

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Box 424, Cincinnati 1, Ohio

WANTED

(Additional Equipment Wanted Ads on opposite page)

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ACCESSORIES

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Pottstown, Pa.

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PLUMBING SUPPLY CO. INC.
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TURBINES—1428 HP, 3600 RPM, 155 P.S.I.G.
AND 100° SH, 27" VACUUM.

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Phone General Purchasing Agent
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FOR SALE

1 NEW Mahr Crucible Melting Furnace, with crucible. NEW oil fired, for melting non-ferrous metals, tilting type. Size: 100. Capacity: 300 lbs. per charge.

1 NEW Mahr combustion air blower for above crucible furnace, belt driven, model 501. Complete with drive, 3 phase, 50 cycle, 220 volt, 1 HP motor with swing base and starter.

1 USED U.S. electric swing grinder 15 HP model 24SF. Good condition.

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598 Steel Wheels 21 x 300, drop center rims, with bearings and washers, 1¼" spindles, hub 6¼" long. New — excellent condition.

2 USED 4000 lb. pillar jib cranes for electric hoist, 10 ft. high, base mounted, with 10 ft. boom and with collector rings.

1 USED 4000 lb. pillar jib crane for electric hoist 10 ft. high, base mounted, with 12 ft. boom, without collector rings.

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Will take 8" x 1" wheel — 4250 rpm — ⅝ arbor — Net Weight 14 lbs. — Length 21".

50% off (List Price $165.00) **$82.50 SALE PRICE**

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Since 1890

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See how VEELOS on Reels
CUTS V-BELT INVENTORY
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Page 3—
New Veelos Catalog

Tested, Proved
and Adopted
by American Industry

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V-BELT
Adjustable to any Length
Adaptable to any Drive

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MANHEIM, PENNSYLVANIA

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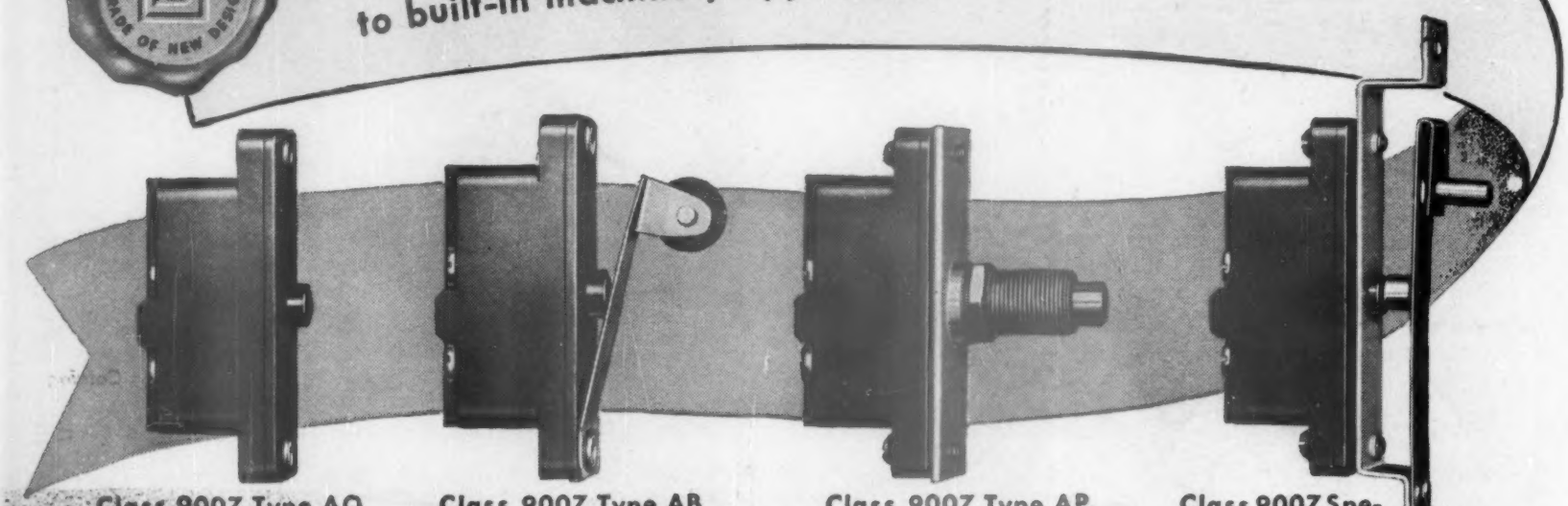

Class 9007 Type AO standard contact mechanism available in several contact and terminal arrangements.

Class 9007 Type AB roller-operated mechanism provides additional over-travel and eliminates side thrust on operating button.

Class 9007 Type AP plunger-operated mechanism has ¾" threaded ferrule for panel mounting, and provides ⅛" additional over-travel.

Class 9007 Special operating mechanism for door switch use—typical of the many special mechanisms that can be designed for a wide variety of built-in applications.

SMALL SIZE with accurate operation, high electrical ratings and long mechanical life—Square D's Class 9007 Type AW precision contact mechanism, built into oil-tight enclosures. Available for either surface or flush mounting, roller or plunger operation, and with a variety of standard and special operating arms.

Class 9007 Type AW

HEAVY DUTY for applications where space is not a factor and service is unusually severe—Square D's Class 9007 Type M contact mechanism in surface mounting, oil-tight enclosures. Threaded conduit hub or back plate opening. Wide range of operating arms including standard and extra over-travel construction, as well as many types of rollers.

Class 9007 Type M

Write for descriptive Bulletin #9007

SQUARE D COMPANY, 4041 N. Richards Street, Milwaukee 12, Wisconsin

SQUARE D COMPANY

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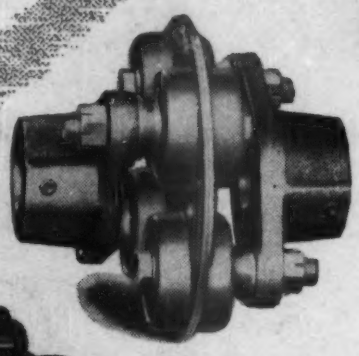
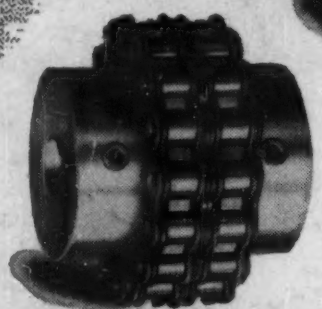
GOOD CONNECTIONS!

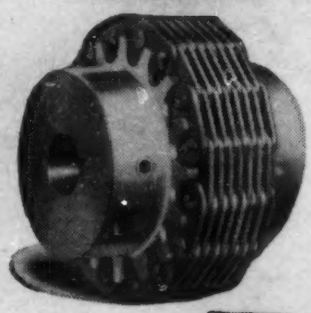
can be made with MORSE COUPLINGS!



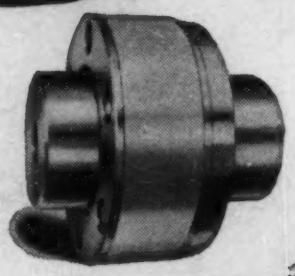
MORFLEX COUPLINGS—Torsionally resilient. Quiet in operation, no metal-to-metal contact. Requires no lubrication or maintenance.



ROLLER CHAIN COUPLINGS—Morse double width roller chain around two sprockets. Rugged flexibility, all-steel design. Compact and economical.



SILENT CHAIN COUPLINGS—Morse silent chain around two sprockets. Easy to connect and disconnect. Compensate for both parallel and offset misalignment.



MORFLEX RADIAL COUPLINGS—Completely machined, perfectly balanced. For large torque capacity. Compensate for misalignment, cushion peak-loads.

IMPROVE YOUR CONNECTIONS! For every application there is a Morse coupling that is ideally suited because of the wide range in types, capacities and prices. Morse couplings are carried in stock for immediate delivery by industrial distributors throughout the country. Morse engineers, backed by years of experience, can assist you. Consult our Coupling Division. MORSE CHAIN COMPANY • Detroit 8, Michigan.

MORSE MECHANICAL POWER TRANSMISSION PRODUCTS

A PRODUCT OF B-W BORG-WARNER